In This Issue: Possibilities for Electric Smelting in the West

JOURNAL OF ELECTRICITY

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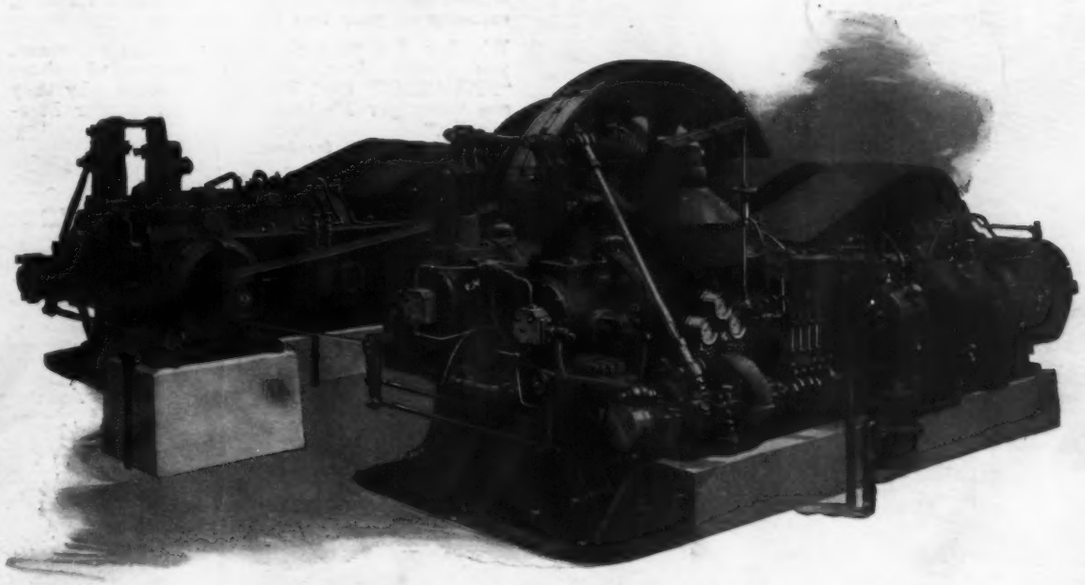

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JOURNAL OF ELECTRICITY

DEVOTED TO THE UPBUILDING OF THE ELECTRICAL INDUSTRY IN THE WEST AND IN THE COUNTRIES BORDERING THE GREAT PACIFIC

Volume 42 SAN FRANCISCO, JANUARY 15, 1919 Number 2

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Theodore Roosevelt is gone from our material vision, but whether we be among his followers or in the ranks of those who bitterly opposed his actions, especially his public utterances of recent months, there are few of us who have not gathered from his life work a new sense of true Americanism — few that have not felt from it a quickened sense of public duty. And his dominating ideals of life — buoyant, virile, eternal in their activity — will live in the realities of life throughout all ages to bless and quicken the pulse of his fellow man in human relationship one with the other.

A Reason for Optimism in the West

The great American shipbuilding contracts, amounting to nearly two hundred millions of dollars, that are now under way in Oriental ports, coupled with the proposed loan of fifty millions of dollars to China by the United States, Great Britain, France and Japan, which has been sanctioned by our State Department, will enable China to take an active part in the rehabilitation of her own economic situation and at the same time present a hand of helpfulness in the great problems of reconstruction that now face the world.

But to engineering and commerce in the West this move has unusual significance. It means that the growth of Pacific Coast States in industry and in power development will be rapid. Already the great banking houses of the nation are preparing to render increased banking facilities. As an instance of how financiers view these possibilities ahead, one great banking house of New York City—the Guaranty Trust Company—has through its subsidiary house, the Asia Banking Corporation, sent just recently fourteen banking experts to the Orient to open up closer relations. This corporation, realizing the tremendous prestige acquired by men of influence in the West, has added to its directorate and executive officers a number of well-known leaders in the electrical industry and in banking circles of the West. Among these may be mentioned Herbert Fleishhacker, president of the Anglo and London, Paris National Bank, San Francisco; M. F. Backus, president of the National Bank of Commerce, Seattle; C. F. Adams, vice-president of the First National Bank, Portland; Challen R. Parker, cashier of the Anglo and London, Paris National Bank, and Willis Booth, well-known in Western circles as chairman of the board of Edison Electric Appliance Company, Inc., to be vice-presidents of the Guaranty Trust Company with residence in New York City.

That such reorganizations as this, which is but typical of the confidence felt in the immediate future for vast growth between the Pacific Coast States and the Orient, are occurring in increasing numbers in every line of commercial and engineering activity, portend a stability and surety for investment in industrial and engineering enterprises is beyond the question of a doubt.

Library Service for the Business Man

There is a unique course in library service that is being put through in the enterprising city of Riverside, California, which will continue during the next several weeks. This service is of intense interest and of great practical importance to business men generally and to members of the electrical industry, as it comes in this day of research and readjustment, with peculiar emphasis.

To be thoroughly up to date and in accord with business practice that is each day advancing with a rapidity never before experienced in history, the business man finds quick and ready reference a matter of prime importance. He must himself accumulate information and file it in easily accessible manner and at the same time have within reach the splendid service of his company library and the library of the community in which he lives. How to collect this information and how to readily apply the information, when collected, are problems that prove vexing and often, if due care and method be not observed, prove disastrous.

The Journal of Electricity is fortunate in being able to announce that a series of some twelve short, snappy articles on this important subject will appear in early issues, covering just these salient features of library service that are so desirable to be known and understood by the business man. The author of the series is Miss Louise B. Krause, librarian for the H. M. Byllesby & Company of Chicago, a firm well known throughout the West for care and system in engineering and business practice. Miss Krause has been president of the Chicago Library Club and has lectured before a number of universities and

library associations. At the present time she is giving the library service course on the business library, setting forth its principles of organization, cost of maintenance and earning value to a business organization, at the Winter School of the Riverside Library Service School above referred to.

It is believed that readers of the Journal of Electricity — manufacturers, jobbers, commercial men, executives of utilities, contractor-dealers, and many other groupings—will find this series of unusual interest and profit in this day of readjustment and interdependence on progress and business methods in other organizations and communities.

The Electric Truck and the Highway

Thoughtful observers see in the future an ever expanding field of usefulness for the electric truck. The marketing of farm products in the enterprising rural districts of the West is being vastly forwarded by the use of trucks. That the electric truck is destined to acquire a broader use in this growing field of activity is the conclusion of all those who are familiar with the favorable conditions offered for this type of traffic carrier, due to the excellent system of highways that prevails in this section of the country and especially to the growing facilities whereby electric current can be acquired for operating loads of this nature in practically any large agricultural area in the West.

The question now arises as to what general action the highway authorities should take in properly safeguarding the permanence of the highways by limiting the truck traffic conveyed over the highways so as to duly protect their structure and yet at the same time encourage this economic development of our rural traffic system which will unquestionably mean much for the utilization of our water power resources and its consequent saving in fuel, and yet at the same time serve so wonderfully in intensifying the economic marketing of the vast agricultural output of the West.

Many methods are being advocated whereby this traffic limitation may be numerically expressed. Much of the discussion seems to indicate an inclination to recommend maximum unit loads of 25,000 to 28,000 lbs. If such a law were passed, it would be very easy to interpret a truck and semi-trailer or a truck and train of trailers as a unit.

As pointed out by one prominent truck manufacturer, the future big use for motor trucks will be in inter-city transportation, and the bigger the load that the motor will draw, the more competition it will be to the railroads for short hauls,—say up to 300 or 400 miles. In order to compete with the railroads big loads must be handled and there is only one way to handle them and that is with trailers. Therefore, there is a possibility of getting laws made that will restrict development.

By the elimination of the maximum unit idea altogether and instead the passing of a law based upon maximum weight per tire inch, in which a distinction is made between driving wheels and wheels that do not have power applied to them, it would seem a more just and scientific appraisement of design could be arrived at.

The experience of one well-known manufacturer who has given a great deal of research attention to the matter indicates that a tire which is not subjected to tractive strain need not be more than half the width of a given weight of one which is subjected to tractive strain. Therefore, should a recommendation be made for a certain weight,—say 800 lbs. per tire inch, it would not be fair to the trailer user because he would have to have bigger tires on his trailer than necessary, which of course means unnecessary expense.

The entire matter, though as yet of little present importance to the electrical industry, has in store such rich possibilities for the future that it would seem well worthy the thought and study of electrical men throughout the West.

Copper Production in the West

Data just compiled by the U. S. Geological Survey indicate most interesting results on copper production in the United States. In view of the vast electrical uses to which copper is put this production has unusual significance for the electrical industry.

The total production of copper for the several states, including Alaska, indicate a total of nearly two billion pounds of copper for 1918. Arizona comes first with a total production of over three-quarters of a billion pounds, Montana second with nearly a third of a billion, and Utah third with a quarter of a billion, while the once leading state in copper production — Michigan — ranks fourth with slightly under a quarter of a billion pounds.

It is certainly a significant fact that the states west of the Rocky Mountains, so prolific in power possibilities, should also be so prolific in copper, the one great metal used so extensively in the electrical industry. Of this great production of nearly two billion pounds of copper in 1918, the states west of the Rocky Mountains produced over eighty-five per cent.

The Kind of Publicity Needed

The manner in which the whole world was convulsed when many of our preconceived prejudices against certain peoples and international actions were exposed to be nothing but the effect of an insidious German propaganda has led thoughtful men to view all published matter with a more critical eye than formerly.

And this brings us to a consideration of the best mode of procedure whereby the truth about the power situation may be the better placed before the public mind, and thus receive the earnest attention it so justly merits.

In order that such data may bear upon its face the stamp of sincerity and the force of conviction it is necessary that any proposed campaign of publicity should be undertaken with unusual care in compilation of facts and figures to be presented—such facts and figures as would indicate to the reader a breadth of view, visualized from what has transpired in world events of recent months with their indelible stamp of a wider humanitarian conception and outlook upon business affairs.

Those who have studied the utility problem and the power situation realize that only by the more open and above board treatment of the problem can action for betterment be brought about. Those who have these matters nearest at heart have formulated clear and unbiased convictions as to their proper treatment and know for a certainty that if only the public mind can see the problem as clearly as they, the conclusions of an unbiased public mind must be the same as theirs.

Hence the whole problem is one of education. No false step should be made in presenting half-baked ideas or data with cloudy or uncertain substantiality. To properly put forth an effective campaign of education or, if you will, a campaign of publicity, it must be realized from the start that the whole problem is deeper and broader than mere newspaper notoriety. It involves the crystallizing of public opinion in the matter of the development of the great water power resources of the West, and this molding of opinion can not be brought about unless the foundation work is laid upon the broadest lines possible.

To this end, not only should the data to be used be most carefully compiled but the channels through which the effort to reach the public are chosen should be most carefully considered, and every step taken should have the planning of a master mind that can analyze to the public in such a way that the public can grasp it.

And the public, when convinced that the whole matter presented is set forth in the spirit of open, fair education and not in the spirit of propaganda, will from the start give the matter the just consideration such broad effort must of its very weight command. Only by such a campaign of education can relief in the power situation be brought about.

Grape Syrup—a New Industry Possible

The temperance wave that is gradually but steadily sweeping the country has led men of the West, who are familiar with the present gigantic investment in the grape growing industry in this section, to view with increasing concern the marketing of the product of the vine when the national prohibition amendment has become a binding enactment. This investment in California, for instance, is of such vast totals as to have become a vital factor in the fight as to whether the state become wet or dry in the future.

To the electrical industry, the saving of this product by the initiating of a new industry in which electrical energy will undoubtedly play a leading part, the problem becomes one of unusual importance. Hence the preliminary report on the possibility of a grape syrup, investigated by two well-known authorities at the Agricultural Experiment Station of the University of California, comes now with unusual interest.

It appears from these preliminary investigations that about 250,000 tons of wine and table grapes cannot be used next year in the usual way. This represents a value of the raw material of over $4,000,000. In the manufactured state, as wine and other alcoholic beverages, this value would be about twice the figure quoted. Such a loss as a consequence will be deeply felt by thousands of grape growers throughout the West.

If these grapes were made into grape syrup, experiments upon the manufacturing and marketing of which are proceeding with unusual promise, the product saved would be equivalent to over 40,000 tons of sugar of a present value of nearly $8,000,000. The investigation above referred to has shown that a grape syrup can be made which is wholesome, attractive and suitable for table use, cooking, the making of jams and fruit butters, and for the canning of most of our fruits. Most of the equipment necessary for making this syrup already exists in the wineries and beet-sugar factories of the state and what is lacking could easily be obtained.

The marketing of this large quantity of a new product could, however, be successfully done only if many fruit canneries could be induced to use a certain quantity of grape syrup during the season of 1920. The entire matter deserves thoughtful consideration on all sides, and if certain governmental regulation is necessary the public generally should cheerfully back up any regulations that may develop as reasonable and proper to protect and assist in salvaging this great product.

The preliminary marketing of the syrup has already brought out interesting comments from sixty-five test purchasers. Sixty-six per cent expressed an opinion of very good, lovely, excellent, very nice, or good, with no unfavorable comment, while less than eight per cent found the product without merit.

The entire matter deserves the strongest support on the part of the public generally and the electrical industry, an industry serving so generously the agricultural districts of the West, is in position to give it unusually emphatic endorsement.

THE NEW JOURNAL SERVICE: The purpose of a very constructive article appearing in the February first issue of the Journal of Electricity, instead of this issue as previously announced, on Salvage of the Waste by H. N. Sessions, the commercial engineer of the Southern California Edison Company, will be to show that we are all more or less incapacitated by lack of thrift, and that part of the cure is salvage.

Electric arc-welding, by means of which the great German ships lying in American harbors were speedily repaired, when otherwise two years might have been necessary in their rehabilitation, is a subject of great interest and importance at the present period of reconstruction. A series of articles on this timely subject, profuse with test data and illustrations, written by one of our national authorities, Mr. F. A. Anderson, with the U. S. Shipping Board in San Francisco, will appear during February. Contractor-dealers have in store some unusually able educational helps that are being prepared by experts with the University of California Extension Division, full announcement of which will be made in later issues.

A BUSINESS LIBRARY COURSE

(A course in business library principles which is being planned by the Library of Riverside, California, to meet the need for training along these lines in the West. Special emphasis is to be laid on Public Utility problems and on the applications of library methods to office requirements. The instructor is herself Librarian of a public utility organization and particularly well grounded along these lines.—The Editor.)

The library class of 1918 taken on the steps of the Riverside Library itself

The course in business libraries which is planned by the Riverside Library Service School at Riverside, California, for four weeks during the month of February, is of considerable interest to public utilities and engineering organizations which maintain libraries of their own. This course is designed to train students for business library positions and also to be of practical assistance to librarians already doing business library work.

Library training is a good preparation for office filing and indexing and for the organization of quick reference material in busy places. The Federal Government and the business world have recruited hundreds of workers from libraries this past year.

The course as planned covers such subjects as: Principles of organization of the library, cost of maintenance and earning value to a business organization; how to collect information and how to apply it to business problems, illustrated by studies of differing types of business libraries (Financial, Industrial, Engineering, Utilities, etc.); Methods of work and mechanical equipment; the application of standardized library methods (classification, cataloging, etc.) to business library files and the equipment and tools required. Reference books and reference problems in business libraries.

The course is to be given by Miss Louise B. Krause who is librarian with H. M. Byllesby & Company, Chicago. Miss Krause has had extensive practical experience in the organization and management of general and business libraries and has given several courses in her special subject before the University of Chicago, the Tulane University of Louisiana and elsewhere. She has been at the head of the Byllesby library since 1909 and has built up a department which has a national reputation for high grade efficiency.

The exact date of the course is not yet fixed, but it will either begin on Jan. 20th, according to the original plan, or two weeks later on Feb. 3rd.

DOES THE BUSINESS LIBRARY PAY?

BY LOUISE B. KRAUSE

Does it pay to have all the valuable information, printed or manuscript, pertaining to your business, collected, properly filed and indexed, and immediately available for use, when you want information on a busy day when every minute counts?

A man need not necessarily be in his office to ask his questions. One firm having a lawsuit in a city distant from the home office, wired for the prices of lead in the past twenty years. The librarian had the answer ready in ten minutes.

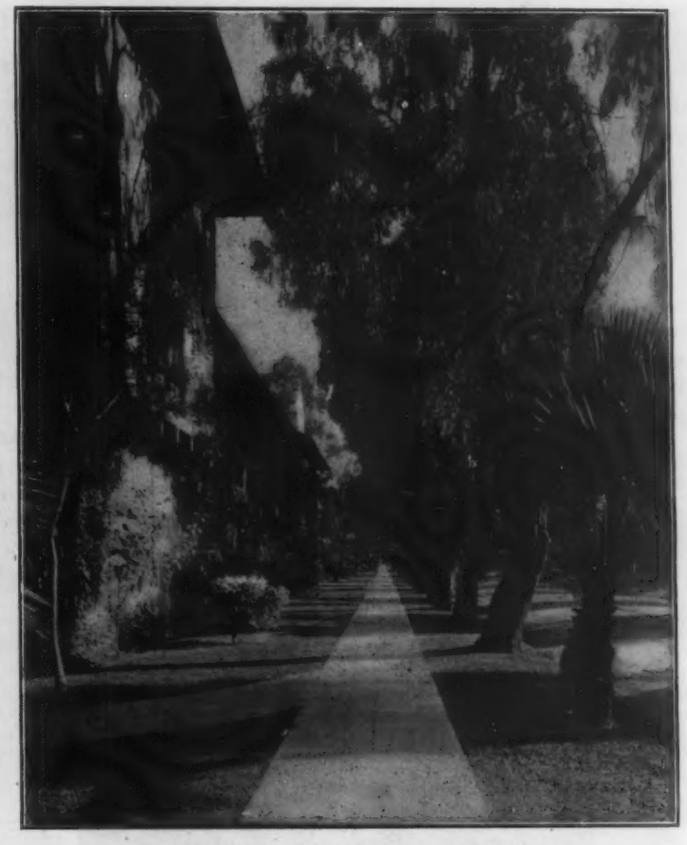
An engineer received a message saying a submarine electric cable which connected two towns on either side of a bay on the Pacific Coast had been damaged. He asked his librarian to tell him the depth of the water in the bay and how shallow it was near shore. The exact data were given him from a government publication.

A bond house asked his librarian to tell them what public utility companies in towns having about the same population as Blankville, and doing the same kind of utility business, had an equally large capitalization per capita. The librarian reported that the comparison showed that the capitalization of the Utility of Blankville was not too large per capita.

A natural gas man asked in a great hurry for the natural gas cases decided by Public Utility Commissions in which "going value" had been allowed as high as 10%. It took the librarian ten minutes to give him all the cases he needed.

A busy official studying on the necessity of increases in street car fares to meet expenses, asked his librarian to give him a list of all the towns in a certain state which had recently increased fares. The librarian had the data all ready for his use.

Does it pay to save the time and energy of the valuable man higher up, by having some one in charge of information, who knows how to forecast his needs and who has the material ready to be used without delay? If so, it pays to train workers to do Business Library Work.



Where the business library course is held

EXPERIMENTS IN ELECTRICAL STIMULATION OF CROPS

(Considerable interest has been shown in this country in the possibilities of stimulating crops by electricity. Most of the practical experiments along that line, however, have been carried out in England. An account of the latest of these tests is given here.—The Editor.)

During 1917 an area of an acre in Calderstones Park, Liverpool, was divided up into plots and sown with wheat, barley, and a number of vegetables, while near by but not near enough to be influenced by the treatment, a similar area was planted with the same crops and given the same amount of patent manure. Especial care was taken that the two areas should be as nearly identical as possible in soil, exposure, and other natural conditions.

The general method of applying the electrical treatment consisted of the use of a series of fine wires suspended from poles on either side of the electrified area. Much care was given to the insulation, which was triple in character, consisting, in the case of the principal insulators, of long glass rods to the ends of which the live wires were attached. A high-tension current was discharged through the air to the plants, and thence to the soil below. The supply of electricity was obtained from the ordinary city mains and then transformed into a high-tension current.

The crops were sown between May 24 and June 6, 1917, and were "lifted" between October 19 and December 5, according as they matured.

The following table gives a digest of the results of the experiment expressed in percentages of increase or decrease in weight which the electrically-treated crops showed in comparison with those which were not so treated:

Crops.	Increase (+) or decrease (—). Per cent.	Crops.	Increase (+) or decrease (—). Per cent.
Beet root	+390	Cabbage	+25
Onions	+633	Potatoes:	
Peas (late)	+ 29	Great Scot	—13
Carrots (intermediate)	+ 29	King Edward	+ 2
Kohl-rabi	+ 3	British Queen	+63
Sugar beet	+467	Barley	+30
Mangolds	+219	Barley straw	—18
Swedes	— 16	Oats	+39
		Oaten straw	+ 9

In explaining the somewhat peculiar results obtained in the three kinds of potatoes, the city officials said that the chief difference between the British Queen and the others is that the former is an early variety. They also stated that they did not consider that any of the crops, on the whole, could be taken as coming up to the average. This might be attributed largely to the soil, which was of a light nature and had been only recently plowed up and converted from pasture.

RAILROAD COAL CONSUMPTION

Present estimates indicate that during the calendar year 1918, United States railroads will have used about 175,000,000 tons of coal for all purposes, including both bituminous coal and anthracite. Of this amount about 157,000,000 tons was consumed in locomotive service and about 18,000,000 tons at stationary power plants and for miscellaneous purposes. In addition, the railroads used approximately 42,000,000 gallons of fuel oil.

THE FIRST HYDROELECTRIC PLANT IN AMERICA

BY C. E. DOOLITTLE

(The little town of Aspen was perhaps the first in America to have its dwelling houses as well as its streets and business houses lighted by electricity from water power. The first application of electric power to mines was undoubtedly made here. The problem of controlling the speed of a water wheel under great instantaneous load changes was first solved at the Roaring Fork Plant and the record for high head (876 ft.) for the year 1888 was probably held by their pipe line. The author was the engineer in charge of the first installation and is now general manager of the company.—The Editor.)

In 1885 The Aspen Electric Company installed at the old smelter of The Aspen Mining and Smelting Company a 60 light Brush arc dynamo belted to a Pelton wheel under 70 feet head. The arc lights were used in the streets and business houses of the town. In 1886 this company constructed a small

HUNTER'S CREEK POWER HOUSE AND PIPE LINE

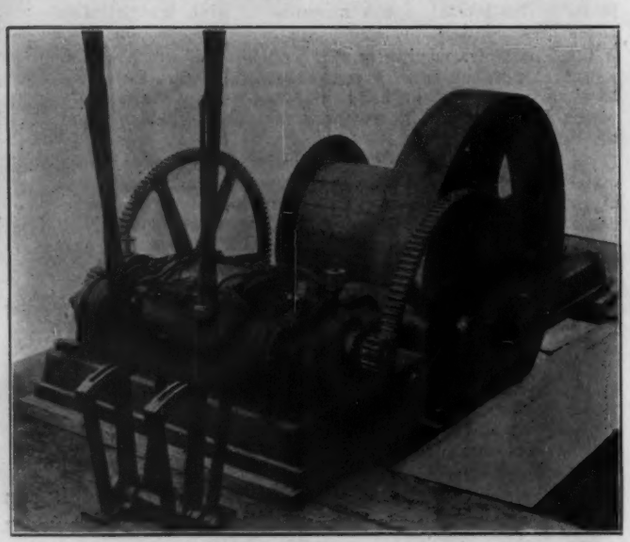
This was built in 1888 and ranks as the pioneer high pressure power plant. From Hunter's Creek a flume 8,750 ft. long and 4,000 ft. of pipe line (shown in the background) furnished a head of 876 ft. This was the record for its time and the object of many pilgrimages among mining and electrical men. The pipe was a 14 in. lap-welded, wrought iron pipe with leaded joints and is still in use, having been extended a mile to the Castle Creek power house where the water from this pipe line is still producing 500 h.p.

water power plant, using a Victor turbine under 55 feet head. In the same year The Consumer's Electric Light and Power Company put in a small plant having a Pelton wheel under 125 feet head and two 60 light Brush arc machines. In the spring of 1887

HUNTER CREEK RESERVOIR BUILT IN 1888

The Aspen Electric Company was organized in 1885 with one 50 light, Brush arc dynamo, and gradually added to its plant as needs grew until in 1888 the Hunter's Creek power house was built. The dam is a filled crib in granite wash. The mud sills were sunk as deep as was possible with only a hand pump to drain the pit. Except for one repair necessitated by a flood, the dam has been tight and solid.

the two companies were consolidated in The Roaring Fork Electric Light and Power Company and two 40 kw. generators for incandescent lighting were installed. These were operated on the Edison 3-wire system. In the fall of that year Frank J. Sprague visited Aspen and tried to persuade the various mine managers to introduce electric power in their mines —especially for underground hoisting. None of the mine managers would take a chance, but J. H. Devereux, a mining engineer, at that time manager and one of the owners of the Roaring Fork Electric Light and Power Company, made a contract with

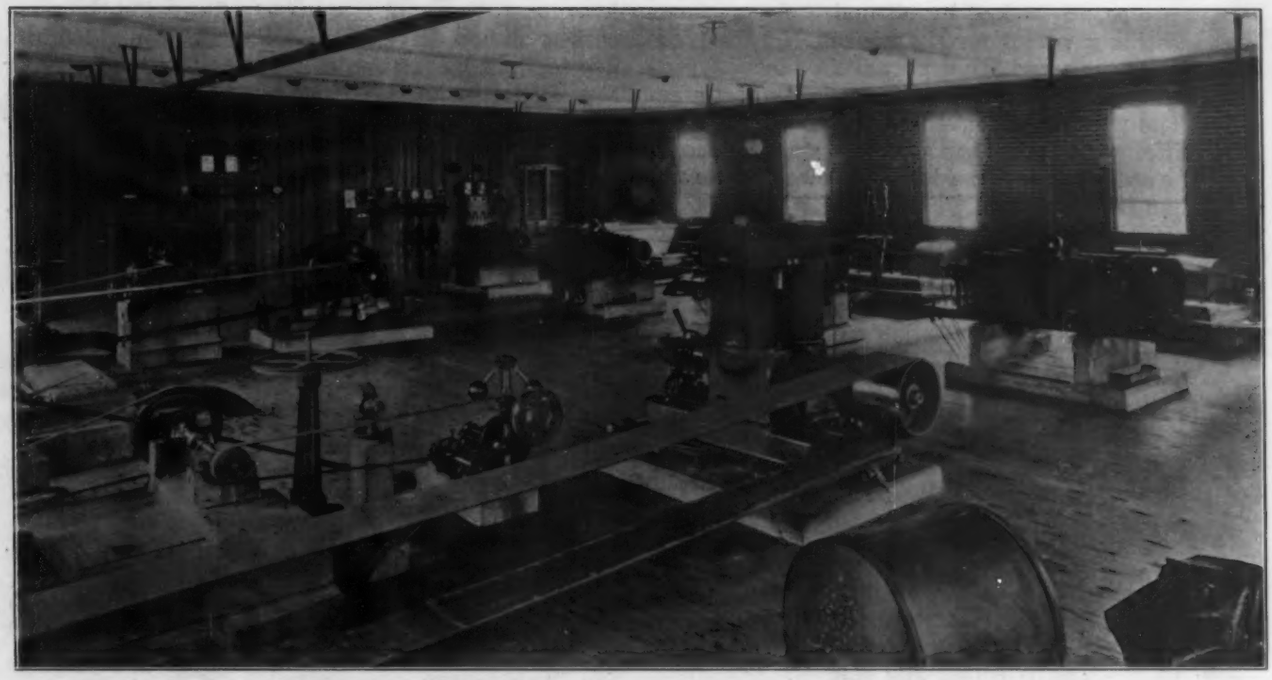


ONE OF THE ORIGINAL HOISTS

This electric hoist was installed in 1887 and was made by bolting together on a wooden frame a Sprague street car motor and an ordinary mining hoist of small size. This was probably the first electrically operated mine hoist in existence.

Mr. Sprague for a 45 kw. bi-polar, 500 volt generator, and a 10 h.p. electric hoist. The hoist consisted of a Sprague street car motor, geared to an intermediate shaft which was connected to the hoist drum through a flat friction drive. The generator was belt driven from a Pelton wheel, and the speed controlled by a Woodward water wheel governor. The hoist was installed in the Veteran Tunnel, 1000 feet underground, and was started in July, 1887. (This hoist is still in use but with another motor.) Two other hoists were added almost at once,—one in The Aspen mine, the other in The Regent mine. The speed of the water wheels varied greatly, but nevertheless the hoists were a great success.

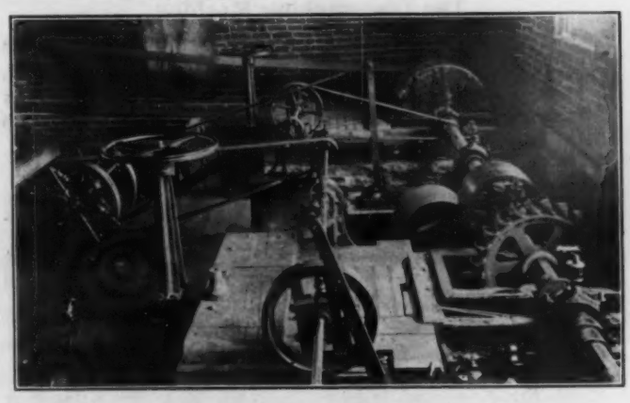
The three small water powers then in use were soon fully loaded, and during the winter of 1888-89 the electric company built a new 500 h.p. hydroelectric plant, using Pelton wheels under 876 feet head. As soon as this power was available a 25 h.p. hoist



INTERIOR HUNTER CREEK POWER HOUSE

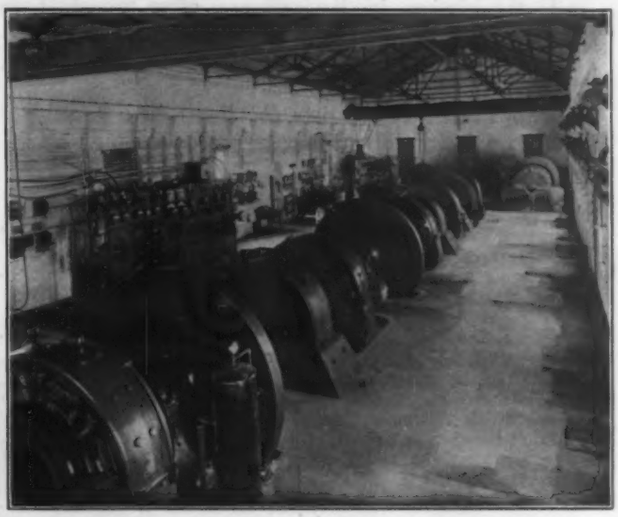
Pictures of the three small power plants which preceded it are not available but this plant itself ranks among the earliest in the country, having been built in 1888. The station was equipped with 9 Pelton wheels each 2 ft. in diameter, supplied with water through deflecting nozzles, with tips varying in size according to the power required.

was added. When this hoist was thrown on the line the water wheel and generator came to a dead stop. This difficulty was overcome, temporarily, by constructing an iron wire resistance coil near the hoist, and arranging the starting switch so that when the switch was thrown one way the hoist was thrown on and the coil off; moving the switch the other way would stop the hoist and put the coil in circuit, thus keeping the load approximately constant and resulting in a great improvement in speed regulation. But there was, of course, a great waste of energy. The mine people were glad to have the heat from the coil to warm the underground hoisting room, but the electric company naturally wished to sell the energy to some other mine, and to take full advantage of the intermittent load due to the various hoists. It was up to the electric company to invent a water wheel governor which would maintain approximately constant speed under great instantaneous changes in load. At the suggestion of W. B. Devereux, we first tried a hydraulic governor, which was the same, as far as it went, as the water wheel governors now in universal use. We had no anti-racing device, and the servo-motor was operated by water from the



AN EARLY INSTALLATION

The wheel in the foreground was used to drive a Westinghouse alternator carrying a load consisting of incandescent lamps. This load varied so gradually that it was easy to maintain the speed nearly constant either by hand or by an old style Woodward governor. The wheel in the corner drove a 100 kw. Edison bi-polar 500 volt generator supplying power for a number of electric hoists. The changes in load were sudden and great. The pulleys of the differential governor were belted one to each of the water wheels, and when the speed of the power generator varied, due to a sudden change in the load, the shaft carrying the loose pulleys and differential gear would revolve and control the supply of water to the wheel having the hoist load, keeping its speed approximately constant. The rate at which the governor acts is proportional to the difference in speed between the two water wheels; that is, it works quickly for a large change in load and slowly for a small change.



THE INTERIOR OF THE CASTLE CREEK POWER HOUSE

This was a further addition to the system built in 1892. Originally the power was produced by five Pelton wheels in three sets and was the very latest of its time in equipment. It has since been remodeled and reconstructed and now contains 4-400 kw. and 2-200 kw., 600 v., d.c. units, each connected to a Doble water wheel.

pressure pipe, instead of by oil under air pressure. We used this governor for six months, but the troubles from racing and from particles of leaves, etc., getting into the regulating valve, made it unsatisfactory. The writer then invented the so-called "Doolittle differential governor," which was a success from the start and was used in our power plants for more than twenty years.

In 1892 the power company was again in need of more power, and another hydroelectric plant was built. This power house contained at first four 200 kw. generators and a number of arc lighting machines, all belt driven from a line shaft, divided into five sections by friction clutch couplings, and having five Pelton wheels. This plant has been reconstructed and enlarged so that it now contains four 400 kw. and two 200 kw. generators for mine power, each having mounted on one end of its shaft a Doble wheel, and on the other end, a cast steel flywheel. There are also two 200 kw. generators, belt-driven from Doble wheels, used for lighting the city of Aspen and adjacent mines.

SELLING ARGUMENTS FOR SOCKET APPLIANCES

BY MAE SAVELL CROY

(Selling arguments for electrical appliances which appeal to women — as reported by a woman in "Contact." Every woman wants to know how the thing works and what it will do for her — here are a few of the answers.—The Editor.)

As a woman who uses them, and appreciates their true worth, I give here a few details of what the most essential labor-saving devices will do for women. In each case I refer to the medium, or family size:

The Washing Machine

What It Will Do	What It Will Save
Wash six sheets in 20 minutes, or the equivalent in small pieces;	The wear and tear from rubbing the clothes on the rubbing board;
Wash blankets and rugs;	Laundry bills for all flat work as well as for blankets and other heavy articles;
Wash all fine laces without damaging them;	Clothing from being ruined by careless laundries;
By means of the electric wringer, drying the clothes almost dry;	Children from contagious diseases often brought home in the clothes;
Boil the clothes in the washing machine.	A woman's back, and perhaps a doctor's bill for internal injury.

This machine will pay for itself in a family of five in approximately two years; the cost of operation is 2 cents per hour.

The Ironing Machine

Iron the bulk of the ironing, including all flat pieces, such as table linen, bed linen, curtains, men's shirts, collars and cuffs, aprons, petticoats that are not too much ruffled, rompers, etc.	A woman's back and feet and arms;
Four hours' ironing in one hour's time;	Over-fatigue in hot weather;
Give a finish to linens that it would require a double ironing by hand to acquire;	Laundry bills;
Press trousers.	Clothing from hard treatment at the laundry.

This machine will pay for itself in an actual saving of money in from two to three years. The cost of operation is 2 cents per hour. The cost of heating the machine is no greater than the cost of heating the old-fashioned irons, as none of the heat goes to waste.

The Electric Iron

Finish the ironing not done on the ironing machine, such as ruffles, shirtwaists, small yokes.	Many steps to and from the stove for irons;
	Heat from going to waste;
	At least one-third of the time for doing the work.

It costs no more to use an electric iron than to use the old-fashioned flatirons heated over the gas stove, unless one is deliberately careless.

The Vacuum Cleaner

What It Will Do	What It Will Save
Remove surface dirt and dust from carpets;	Having to clean so frequently, as there is no dust flying over the room to settle again;
Free from dust draperies, upholstered furniture and clothing;	The throat and lungs of the one who is cleaning from being coated with dust;
In addition to the above accomplishments, the cleaner with the motor-driven brush will shake the carpet and loosen the imbedded sand and grit which is then sucked up into the bag, pick up hair, lint and threads from the carpet and raise the nap of the carpet, renewing the brightness.	The hair, complexion and hands from being made grimy with dirt and dust;
	The wear and tear usually attendant on the one who has to sweep;
	Laundry bills, inasmuch as sweeping is no longer a dirty job.

The Electric Sew-Motor

Relieve a woman of all strain of operating a sewing-machine;	One-third the cost of clothing, inasmuch as clothes made at home will last three times as long as those purchased at the same price;
Permit the prospective mother to sew without danger of injury;	A woman's back and legs; and with reference to the prospective mother, a doctor's bill and perhaps a life—or two of them.
Enable one to do a morning's work in an hour;	
Sew as fast or as slowly as desired.	

The Dishwashing Machine

Wash dishes for six persons for a 5-course dinner in three minutes;	Putting the hands in hot, greasy dishwater;
Thoroughly clean the dishes, including egg cups;	The breaking of dishes;
Wash vegetables.	An hour's time three times a day, or twenty-one times a week, in a family of six;
	The drying of dishes.

The Electric Fan

Drive out the flies;	Diseases that flies transmit;
Dry fruits and vegetables and keep the room cool at the same time;	Fruits and vegetables that otherwise might be allowed to go to waste;
Keep the baby cool on hot days and thereby prevent summer illnesses.	Perhaps a doctor's bill.

The Electric Range

Cook the dinner while you are keeping the baby out of doors in the fresh air; or while you are down town shopping;	One-third of your gas bill;
Bake, roast, boil and stew;	Fatigue from standing over a hot stove;
Impart a very superior flavor to foods;	Food from being spoiled by burning;
Relieve you of all thought of danger from fire while your food is cooking.	Since meat deteriorates 25 per cent in weight when cooked in the ordinary oven, and only 8 per cent when cooked in the electric range, 17 per cent will be saved by using the electric range.

COOPERATIVE CAMPAIGN PROBLEMS

BY W. F. BRAINERD

(Practical suggestions from the actual experience of the California Electrical Cooperative Campaign field representative in northern California. Some most effective advertising was brought out by the Christmas campaign as is indicated below. Another hint points out a means of saving money in the use of window drapes.—The Editor.)

ADVERTISING THAT BRINGS RESULTS

One of the interesting developments of the cooperative advertising campaign which is being conducted by the California Electrical Cooperative Committee is the large advertisements run by dealers on a cooperative basis in various papers in the state.

—a "Gift that satisfies the sense of fitness as well as practical needs."

By All Means Make Your Gift an Electrical One

The burden of work that American genius has placed upon the shoulders of "Electricity" has astounded the world.

Electrical appliances have become an exact science. The better class have been studied, developed, perfected. Their dependability is unquestioned anywhere. These are standard makes, all of them. Any article you select carries the assurance that it is, and will prove to be everything claimed for it. The choice of any of them should be the most natural way of showing a Friend, Mother, Father, Sister, Brother or grand old Folks of advancing years that the best is none to good for them.

When You Buy "Electrical" Appliances From These Merchants, Their Electrical Knowledge Is Your Protection In Buying Electrical Goods

Cal. Mech. & Electrical Eng. Co. — Sacramento Appliance Co. — The Electric Shop

"Hobrecht" — Sterling Electrical Co., Inc. — Electrical Supply Co.

COOPERATIVE ADVERTISING

By combining together, these six electrical merchants of Sacramento were able to take a full page spread, with results which proved eminently satisfactory to all concerned.

A number of these ads have appeared featuring electrical goods as Christmas gifts and signed by the various electrical dealers in the town. By this cooperative effort it is possible for them to give a wide publicity to electrical goods for the holiday trade which would not have been possible in any other way.

The full page ad reproduced here was run by six electrical dealers in Sacramento. The cost of the ad was proportioned according to the benefit each dealer was expected to derive from it. All of the participants in this little campaign expressed themselves as greatly pleased with the results. No doubt the next holiday season will see a much greater use of this cooperative advertising by the electrical dealers.

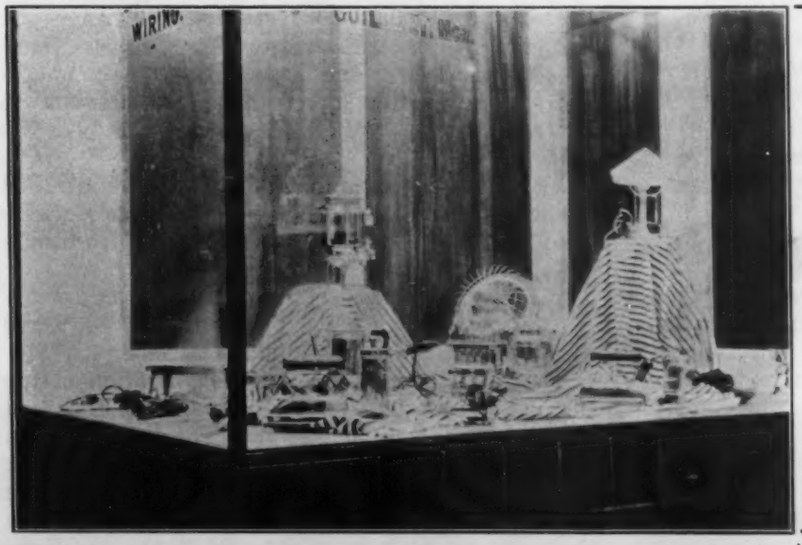
WHAT TO DO WITH THE WINDOW FLOOR SPACE

The problem of finding a satisfactory draping for the floor of the show window is one that confronts most of the electrical dealers.

Different shades of velvet are especially desirable for this, but at the present war prices it is too expensive for many dealers.

John Guilbert, of the John Guilbert Electric Company, San Jose, has found a way of overcoming this when the windows have attractive hardwood floors. By draping a runner about six feet long over the floor and bringing it up over pedestals in the rear, he is able to give his window a very attractive and rich look.

The drape shown in the photograph consists of six yards of black and white sateen which was purchased at fifty cents a yard. The use of this drapery makes a great improvement in the appearance of the window, giving it an artistic look that is sure to catch the eye of the passing shopper.



Velvet undoubtedly forms an effective background for the display of electrical ware, but it is too expensive to permit of change and variation from week to week. The problem of what other material can take its place has been neatly solved by the John Guilbert Electric Company of San Jose who have proved how effective black and white sateen can be as drape material with a hardwood window floor.

Western Ideas

"JUST A PIECE OF STRING" was the way the letter commenced—and the string was there fastened to the corner of the paper with a bright red seal. The letter went on to explain that the string was furnished in order that you might tie it about your finger and remember to attend the Jovian Convention. And although, of course, it was not tied about the finger of the reader, it was remembered just the same. Not only was the idea original and pleasing and adapted to any occasion, but the string itself was a bright blue and the seal was a bright red, and the result a patriotic and attractive blot of color which made the letter stand out from its fellows.

STICKERS are used to advertise their range business by the Northwestern Electric Company of Portland, Oregon. The little colored pasters, of which several are shown here, are about twice the size indicated—and are pasted on bills and letters which go out to customers of the company. They

Notice
THE electricity we supply you with is generated
use at this time for ELECTRIC RANGES
national needs in the saving of fuel
NORTHWEST
Help Save Fuel and Food
"Cook by Wire"
installed complete. EASY TERMS if desired.
ECTRIC COMPANY
Now is the Time!
For America to correct her unpardonable fault of wastefulness and extravagance. "COOK BY WIRE" you save food, fuel, time, transportation.
ECTRIC COMPANY
KEEP COOL
Electric Ranges installed complete
"COOK BY WIRE"
We sell electric ranges on easy terms.
NORTHWESTERN ELECTRIC COMPANY
LIGHT—POWER—HEAT

Colored stickers which bring range sales

serve as a reminder of the range department—the more necessary because the company does not carry on a retail business in general appliances. The initial impetus given by the stickers is then followed up by the company's salesmen with excellent results.

Similar stickers advertising special features or with the trademark of their store have been profitably used by contractor-dealers. They find infinite application. They may be used to seal packages, to add an attractive bit of color to a letter, or as pasted on the base of electric appliances sold to serve as a constant reminder of the store where the wares were purchased.

TO THROW AWAY CARBON PAPER when it begins to wear thin, is a useless extravagance, according to Popular Science Monthly. The suggestion is there made that your used carbon or transfer paper can be made to last much longer by simply holding it over an open flame such as a lamp, candle or match, with the carbon side down. The wax substance of the unused parts will melt and run into the thinner sections of the parts which are worn out.

PERSONALITY IN ADVERTISING is always a virtue—and here is an advertisement which carries its message largely from that one element. It is simple, informal—you read it and you like it. With

Ink Ideas—Stolen From Dealers

(A Confession)

YOU see it is this way. I was to write an advertisement for the Sanford Manufacturing Company of Chicago and New York City—the old reliable folks who for nearly sixty years have made it almost a religion to produce the best inks and adhesives in America.

That was the job. The honest truth is I didn't know so very much about inks, or pastes, mucilages, good, bad, or indifferent.

So I got to wondering what the dealers thought of Sanford's goods. Aha! that was an idea! Immediately I said to the good wife,—"Won't you please go out and buy a bottle of Sanford's Ink and let me know how many of our stores don't carry it in stock and why."

I figured possibly some persuasive merchant might convince her that in some respect Sanford's wasn't quite the best, and thus I'd get a hunch where to use the soft pedal, but I was all wrong.

Here's her report: "Every last one of the six stores I visited advised me to take Sanford's on account of the excellent quality."

So I decided to canvass a different part of town myself, and for one whole forenoon went from store to store asking dealers why they bought Sanford's Inks, Paste, and Mucilage.

Result: It was one continuous testimonial to the fair and courteous treatment from the House of Sanford, and the superior quality of Sanford's goods.

I confess I have stolen the ideas of the dealers [about Sanford's products and policy.

I am writing this confession out of the ten cent bottle she bought. The label reads—

Sanford's Premium Writing Fluid—Blue-Black, Never Fades.

A pleasant informality which succeeds because it sounds genuine

no particular wish to advertise the brand of ink, the advertisement is nevertheless reproduced here as a clever achievement which may suggest similar clever achievements, perhaps along electrical lines.

THE BEST OF INTENTIONS may not prevent a retail store from making enemies through a misunderstanding on the part of customers who make a deposit in connection with a request to have goods held, as a bulletin from the National Vigilance Committee of the Associated Advertising Clubs suggests. Store good-will is often destroyed through a failure to make customers, and especially women, understand that when a deposit is made, this amounts to a contract on the part of the customer to take the goods.

From various communities where there are local vigilance committees, the National Vigilance Committee has had reports of trouble arising from misunderstandings of this character.

"Can you hold this for me?" the woman asks.

"Yes, if you will make a deposit of ——," says the salesman, naming the amount to her.

That is all there is to the conversation in too many instances. The salesman presumes that she knows that when she makes the deposit, she enters into a contract to buy, but that is often a violent presumption, says the vigilance committee. In a large number of instances, women return, announce

that they have changed their minds, and ask for the return of their money.

Many such cases come to the attention of local vigilance committees, for the committees advertise that they are prepared to receive complaints from persons who feel they have been mistreated. In such cities the committees, of course, take the part of the merchant, but even where there is a vigilance committee on the job, some customers still feel that an exception might be made in their case.

The vigilance committee suggests that one certain way to insure that all customers will understand the terms of such sales would be to print a special receipt for payments of this kind, the receipt to set forth the fact that unless the goods are taken by a certain date, the cash deposit will become the property of the store.

ANNOUNCING THE COMING OF YOUR SALESMAN in a way to impress the fact on the prospective customer's mind is the object of all communications preceding such calls. Some write letters—some telephone—but here is how Eardley Bros., successful firm of electrical contractor-dealers of Salt Lake City, do it. Incidentally the card is one which may be used in connection with an order concerning which there has already been correspondence

This is the reverse side of an ordinary postcard. Note the use of the trade mark in the upper right hand corner.

—or for more general purposes, when its message is still carried home.

MAKING THE WASHING MACHINE PAY FOR ITSELF was the method used by one Denver woman as reported by the Denver Gas & Electric Light Company, who are carrying on a washing machine campaign. The suggestion is one which might be passed on to customers—not necessarily as something which they should carry out, but as an interesting incident which shows the economy and practicability of the machine. Incidentally the idea may suggest to them a means of paying for a machine they could not otherwise afford.

The woman in question had purchased an electric washing machine some years ago. Recently the salesman called at the house and found that the woman purchaser had made the machine pay for itself three times. This housewife has a very fine laundry in her basement which she rents out, together with the use of the machine, four days a week at $1.50 a day. Incidentally, the purchaser was unconsciously advertising the merits of the machine to the laundry lessees.

IT IS NOT ONLY A CONVENIENCE to your customers to arrange and display your goods in groups that are naturally associated but it is also good salesmanship to do so, according to Advertising and Selling. Among the multitude of articles displayed in the 5 and 10 cent stores there is no haphazard placing of them, if the store is one of the progressive kind. On the contrary things are so grouped that one purchase will naturally suggest another. When, for illustration, a man purchases a tooth brush, tooth paste or powder should be close at hand and if they are close at hand he will in all probability purchase the paste or the powder. But if he is obliged to go to another part of the store, he may either defer getting the latter article, or tell himself that he will get that "at the next stop."

The Monthly Sales Service issued by the Society for Electrical Development gives some excellent advice on this subject to dealers in electrical goods and the principle applies with equal force to all kinds of merchandise:

There is a way to display various articles of merchandise for sale at retail so that inspection or purchase of an article belonging to one group most strongly will suggest inspection and purchase of articles in other groups.

The inspection and purchase of writing-paper, for instance, suggests to the mind those other items used with it—envelopes, pens, ink, blotters and so on. The proper grouping of articles so associated in use makes operative the power of suggestion and promotes many purchases that otherwise would not be made.

Progressive 5 and 10 cent stores appear to depend almost entirely upon such arrangements of stock to effect sales. Study the arrangement of stock in typical store of this kind and you shortly will come to see that all is the result of careful planning. Everything reflects that aim to make the purchase of one article suggest the purchase of others related to it in use or association.

Then by way of contrast visit the average small merchandising establishment and note the haphazard arrangement of the stock. Observe that articles not associated in use are placed frequently cheek-by-jowl and that those which should be grouped are as far removed as the limitations of the store permit.

Electrical appliances and fixtures offer good returns for the slight amount of work required to arrange them so as to derive full benefit from the power of suggestion, and such groupings should be made always.

Take pencil and paper and make lists of those items of your stock which group naturally. Do not leave anything to chance. Have a "reason" for the location of every class of items in your stock. If the location of an article is discovered to be wrong, change your reasoning before you move the merchandise. That's the way to improve.

Make a diagram of your store. Study it (at home nights, if necessary). Work out the location of your groupings on paper before disturbing your stock.

RULES FOR WIREMEN

(The following set of rules for wiremen has been issued by the Pittsfield Works of the General Electric Company. They are made up of safety suggestions for all who handle electric circuits in whatever capacity and will prove of especial interest to the electrical contractor who may wish to pass some of them on to his assistants.—The Editor.)

1. **General**—Men engaged in the handling of electrical circuits are sometimes exposed to hazardous conditions and it is necessary that they cultivate the habit of being very cautious.

The following rules cover some of the duties and precautions to be observed by wiremen and electricians. If any of the rules are not clear or for any reason it appears necessary to violate any of these rules, consult the superintendent of the electrical department.

2. **Suggestions** — Suggestions, alterations or additions, which will make these rules more complete and useful are solicited.

3. **Read the Rules**—These rules must be read by men entering upon the electrical work and should be reviewed occasionally by those who are regularly employed in the electrical department. Men must become familiar with the conditions surrounding the work in which they are engaged.

4. **Responsibility**—No responsibility should be placed on a man until he has confidence and knowledge to do the work.

5. **Safety Devices**—Too much confidence must not be placed in safety devices which are furnished to make the work less hazardous.

Take every precaution to see that the body is well protected before any service is required of a safety device. Remember that it is possible for any safety device to get out of order and become inoperative.

6. **Rubber Gloves** — Rubber gloves are furnished for the use of those who require them on hazardous jobs. They must not be relied upon to furnish absolute protection. Care should be taken to keep rubber gloves clean and free from grease and other solvents of rubber.

7. **Tapping Live Circuits**—No repairs, alterations or examinations requiring handling of live wires should be made except in case of urgent need and then only under the personal supervision of a foreman.

8. **Grounding** — The frames of all motors, switchboxes, transformers, etc., must be substantially grounded.

9. **Grounds** — Assume that all circuits are grounded and properly insulate your body against all wires.

10. **Dangerous Voltage**—All voltages are dangerous for wiremen. If the voltage is not great enough to produce a fatal shock the sign should give its value.

11. **Danger Signs** — Danger signs should be placed at all points where one may accidentally come into contact with live wires. Signs should be removed when the danger has passed.

21. **Two Men** — Whenever it is necessary to make a tap in a live wire or work in the vicinity of live parts, two men must always be employed.

13. **Tagging Feeder Switches**—When a circuit is opened for the purpose of making changes, the controlling switch should be tagged and blocked and the tag signed by the man who opened the switch. The switch should be closed only by the man who signed the tag.

If the switch has been ordered open by two men they should both sign the tag and the switch should be closed by the station attendant only when positively notified by the two persons whose names are on the tag. Besides opening the switch, the disconnecting switches or cutouts should be opened as an additional safeguard against having the circuit closed unexpectedly.

14. **Short-Circuiting Lines**—Where the circuit on which work is to be done has been opened, short-circuit the wires before proceeding with the work and keep them short-circuited until the work has been completed. Don't forget to remove the short-circuit when the work has been finished.

15. **Dead Circuits** — Dead circuits should be treated as if they were alive. This develops a cautious nature and may sometimes prevent an accident caused by another person's error.

16. **One Hand**—As far as possible use only one hand when working about electrical circuits and switches.

17. **Rolling Up Sleeves**—Do not work on circuits with sleeves rolled up.

18. **Tools**—Do not use tools or ladders that are imperfect or defective. Report such matters to the foreman.

19. **Rubber Mats**—See that you are properly insulated from ground by a rubber mat, insulated stool, or other insulating material when operating switches, or working on circuits.

20. **Fuses and Cutouts**—Pull and place fuses with insulated fuse pullers. Pull the live end of the fuse out first. When placing fuses put live end in last.

Do not leave fuses uncovered. Pull and place fuses very carefully to avoid short-circuits or grounds.

21. **Fusing Circuits**—Motors should be fused for not more than three times the motor capacity. Lighting circuits for not more than twice the capacity of the circuit.

22. **Extended Shaft**—If a shaft extends beyond the bearing housing, it should be protected by a proper covering.

23. **Rubber Shield**—A shield may be used as a protective device for men working on poles. The shield covers the wires with which the wireman may come into contact while work is being done on a selected wire.

24. **Safety Belts**—Safety belts should always be worn by men working on overhead lines.

25. **Caution—Don't take chances when handling electrical circuits. Be sure you are right before you proceed with your work.**

26. **Protection for Eyes**—Heavy blue or black glasses should be worn when it is necessary to look at an electric arc.

To prevent dirt entering the eyes when chiseling

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ARTHUR H. HALLORAN, ASSISTANT BUSINESS MANAGER

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HOW THE WEST TAKES A NEW LEAD IN CONSTRUCTIVE DEVELOPMENT —

THE world beating engineering records of the West, wherein twenty gigantic new feats, surpassing in magnitude and daring any of a similar nature elsewhere in the world, were forcefully dwelt upon in various issues of the Journal of Electricity during 1918. With this issue an account of a new lead in constructive development is set forth. Not in piercing mountain fastnesses with tunnels nor in stretching giant transmission lines across the desert is this feat concerned except in providing able and effective means whereby accurate and definite information may be readily found concerning facts and figures necessary in the business operation of a great industry. Nevertheless the Riverside Service Library, situated in a delightful and enchanting section of California, in initiating its unique and helpful course on the business library, under the able direction of a business librarian from one of our great engineering managerial companies, is to be congratulated on bringing into life a movement that is destined to grow from small beginnings into a sphere of usefulness, in full keeping with other great constructive ideals that have made the West so justly famous in material accomplishment and in providing means whereby facility and ease in execution may the better be attained.

holes in concrete, stone or brick for the support of wiring devices, protecting glasses should be worn.

27. Damp Places—To avoid possible shock due to grounding, when work is being done in damp places, extra precautions should be taken to insulate the body.

28. Live Circuits—Do not work on live circuits until you have received instructions from the superintendent or foreman in charge.

Make the circuits dead whenever possible before work is begun.

29. Lamp Circuits—When working on lamp circuits be sure that you are well insulated from the ground and that the lamp circuit is open.

30. Closing Switches—Do not close a switch without full knowledge of the circuit. Do not close switch in a hesitating manner, but close it in a positive manner, using sufficient force to make full contact of blades.

31. Identity Switches—As far as possible, all wires, cables and switches should be tagged or lettered so that they may be readily identified.

32. Tampering—Employes not connected with the electrical department must not tamper with any electrical circuit.

33. Tool Handles—The handles of tools should be covered with rubber tape to prevent slipping and to reduce the opportunity for short circuits across them. Such taping should not be relied upon for safety to workmen.

34. Manholes—If a cover is removed from a manhole, see that the opening is properly guarded. If the work is being done in a manhole, there should be a man on guard at the top of the manhole.

35. Resuscitation—Learn the "prone pressure" method for resuscitation from an electrical shock.

36. Neat Wiring—All wiring must be done in a neat and workmanlike manner and in accordance with Underwriter's Rules. Wires carelessly installed are dangerous and often are the cause of short-circuits.

37. Switches — Switches should be left **wide open** when in the open position and **fully closed** when in the closed position.

38. Defective Apparatus—Report to your foreman all electrical apparatus which is in any way defective or inoperative.

39. Insulation—Do not trust the insulation on a wire for protection from a shock.

40. Doubt — If you are in doubt about the proper performance of any work which you are told to do, say so. **Don't take a chance.**

41. Joints—Connections between cables must be well made. Wires must be bound and soldered and the joint carefully insulated. When wires are held in contact by means of screws, be sure that the screws are set down tight. A slight movement of the wire or cable while setting down a screw will tend to make the joint tight.

42. Loose Ends—Do not cut the ends of wires and leave them exposed. If the wires cannot be removed, see that the ends are well insulated.

43. Tapping Insulated Wires — When tapping live insulated wires, remove insulation from only one wire at a time. Do not expose another wire until one tap is made and joint is insulated.

44. A great many employes injured about electrical apparatus are not connected with that work. They are injured through ignorance of the danger or because effective safeguards are not provided. It is, therefore, within the province of the employes of the electrical department, to warn all persons, such as plumbers, carpenters, machinists, etc., who are working near the electrical conductors of the danger to which they are exposed.

COOKING BY ELECTRICITY UNDER WATER

One of the interesting minor parts which electricity played in the war was that of furnishing energy for cooking under water. This feat has its disadvantages, but when you have a nice waterproof kitchen on one of Uncle Sam's safe submarines it is not so bad, according to Mrs. M. A. Wilson, of Philadelphia, who trained cooks for the United States Navy.

Enlisted men were Mrs. Wilson's students and pupils and she conducted some of her cooking classes on board battleships and submarines. She tells of being 39½ hours under water on a submarine.

Housewives who are interested in submarine cooking will learn from Mrs. Wilson that the intense cold from the bottom of the ocean must be considered by the submarine cook.

Electric Stoves Used

"Electric stoves are used," she says, "but food which requires a high temperature must be cooked before the submarine is submerged."

She tells of her work in this way:

"I began with a class of 50 men. Today I have 1,000 men under training.

"I have spent days taking oil ranges apart to find out why the men could not make them work, finally discovering that it was because they had kept the flames too high. The work done has conformed entirely to navy requirements. One must find the amount of food named in the regulations to serve at a cost of 45 cents a day.

Course of Five Weeks

"The cooking course lasts five weeks, every day from 5:30 a.m. to 7 p.m. Every man must know how to make bread and under very different conditions from those on land. The variation in temperature is great and the water used must come from the ocean.

"The boys are enthusiastic about their work and I don't believe I have ever seen a finer class of men. We have doctors, lawyers, clerks—all professions and trades represented. There have been practically no failures.

Her First Class

"In Boston 225 men were turned over to me to train as commissary stewards. I did not know what was required of such an officer. I went to Cape Henlopen to find out what a commissary steward was supposed to do. Then I immediately put these 225 men into white suits such as navy cooks wear and put them into the kitchen to learn how to cook as a foundation for their work."

THE CONTRACTOR-DEALER SITUATION

BY M. A. DE LEW

(The recent get-together dinner held in San Francisco between the Pacific Coast Section N. E. L. A., the San Francisco Electrical Development League, the Electrical Contractors and Dealers' Association and the Pacific Coast Electrical Supply Jobbers brought out much of general interest in the speeches and discussions. The following paper by the president of the California Contractors and Dealers' Association ably presents the point of view of his branch of the industry.—The Editor.)

The only way I know of bringing to your attention anything that will interest all those present is to present what might be termed the contractor-dealer's troubles.

The contractor-dealer is primarily the agent of the power companies, to get business for them. He must not only get business but it must be of a desirable class. Should he fail, he at once sinks into oblivion in the eyes of the commercial manager and is discarded.

Right here, permit me to speculate on the building of a foundation that might prevent disasters of this character. Can a contractor-dealer bring about desirable results without the assistance of the commercial manager? He cannot. But, rather, he can bring about results in direct proportion to the co-operation extended him by the commercial manager of the power company.

Especially in the past, and even at this time, there is not that coordination of effort which might produce the maximum of results.

Would it be presumption on my part to suggest that you take the contractor-dealer into your confidence and inform him just what different kinds of business you may find most desirable in the various sections which comprise your systems? For the past year or more we have been doing quite active duty in the line of socket appliances and with considerable success, but there are larger and more important efforts to be undertaken if anything like maximum is to be reached.

For the contractor-dealer let me ask: What can we do, either individually or collectively, to create or assist in the creation of desirable new business?

Another and no less important branch of our industry is that of the manufacturers. In bygone days, the manufacturers, actuated by their own interests, really accomplished a great work of cooperation by visiting the contractor-dealer and explaining the many superior points of mechanical construction, as well as the high commercial or electrical efficiency of the articles of their production. This practice should not only be renewed, but with increased vigor. What I would like to do is to drive home to the manufacturers this point: that because Smith buys from Jones, is no reason that Smith should be left to believe that Jones sells all the good things that are to be obtained in the whole world. Get your articles of manufacture before the contractor-dealer; his private opinion does not count — the industry needs every article of merit.

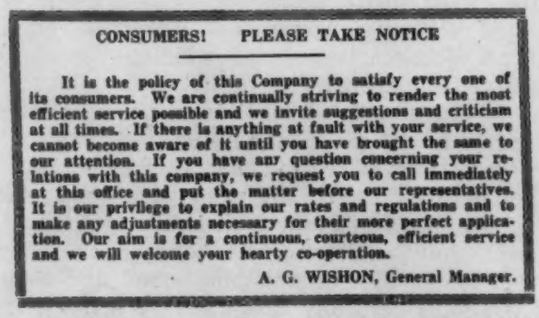
Another important branch of our industry, the supply dealer's. He, like the rest of us, already has had his hands blistered, but like the balance, his hands have not begun to get sore. I imagine that the supply of materials and the method of distribution are like the "poor," always going to be with us, although I believe they are moving in the right direction. If I be permitted to venture an opinion let me say frankly: That until such time as the supply dealer shall arrive at the conclusion that "trade discounts" shall be extended only to concerns whose duty it is to promote the welfare and integrity of the electrical industry, the water is too cloudy and the stream too deep for all to ford.

Notwithstanding the conflict of opinions, all branches of our industry have been able to maintain the most friendly relations. The contractor-dealer feels that this opportunity to express his ideas is but another link in the chain that shall more closely unite us.

In the past, the very existence of the contractor-dealer depended on his merits in the creation of new business, and entirely too often, gentlemen, he has seen the fruits of his labors plucked by unjustified business transactions.

Finally, it may appear to some of those present that the ideas expressed by me border too much on "capitalism" in this day of so-called "socialistic tendency." It matters not in what category or under what "ism" your imagination shall embrace them, the proper coordination of all essential branches of the electrical industry must be benefited if we are to attain real success. No one in the industry appreciates more than the contractor-dealer the rapidity with which the day is approaching when no legitimate business can permit to exist any recognized adjunct whose aim is to take, and rarely, if ever, to give.

UTILIZING THE BILL to bring about better feeling between you and your customer is rather a novel suggestion—but this is just what has been done by the San Joaquin Light & Power Corporation, who make use of the vacant space on the back of their bill forms as is here shown. In place of the bill bringing a feeling of irritation, therefore, it bears



CONSUMERS! PLEASE TAKE NOTICE

It is the policy of this Company to satisfy every one of its consumers. We are continually striving to render the most efficient service possible and we invite suggestions and criticism at all times. If there is anything at fault with your service, we cannot become aware of it until you have brought the same to our attention. If you have any question concerning your relations with this company, we request you to call immediately at this office and put the matter before our representatives. It is our privilege to explain our rates and regulations and to make any adjustments necessary for their more perfect application. Our aim is for a continuous, courteous, efficient service and we will welcome your hearty co-operation.

A. G. WISHON, General Manager.

This plea for cooperation covers the rear side of the regular monthly bills

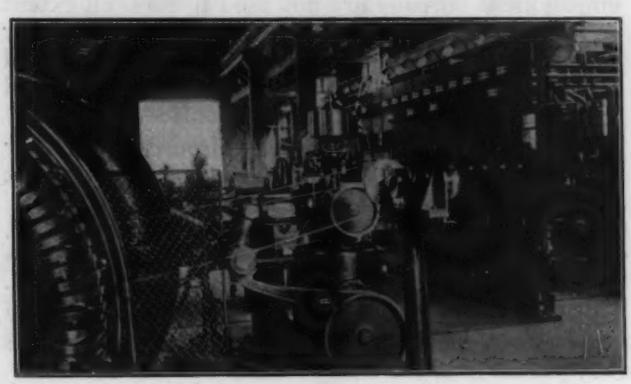
its soft answer always with it, to turn away any wrath the unreasonable consumer may chance to feel. The position of any organization depending on its character as it is understood by the public, it is obvious that this form of advertising is most effective—and the suggestion is one which might be applied in other forms to retail stores or contractors' monthly statements.

THE POWER PROJECT AT HETCH HETCHY

BY RUDOLPH W. VAN NORDEN

(The Hetch Hetchy water and power project as planned by the city of San Francisco involves a development of power at Hetch Hetchy, another just above Early Intake and a third at Moccasin Creek. Of the three the one at Moccasin Creek, involving the development of 66,000 h.p., will be the only one carried out in the immediate program. Details are given below. The author, who is a well known engineer of San Francisco, has recently described the project in general for the Journal of Electricity and is intimately familiar with its progress.—The Editor.)

The invert of the tunnel at the Early intake is at El. 2320 while at the Priest outlet portal it is 2170 ft., a total fall of 50 ft. in 18.4 miles. The diversion in the Tuolumne river will consist of a cyclopean arched dam 40 ft. high, whose crest will be at El. 2340, or 20 ft. higher than the tunnel invert. It is proposed to install suitable gates in the dam and through these the flow will pass into a



The interior of the temporary power plant now located above Early Intake. This is to be discontinued when the complete development carries the water from Cherry Creek and Eleanor to the Hetch Hetchy through the Eleanor tunnel.

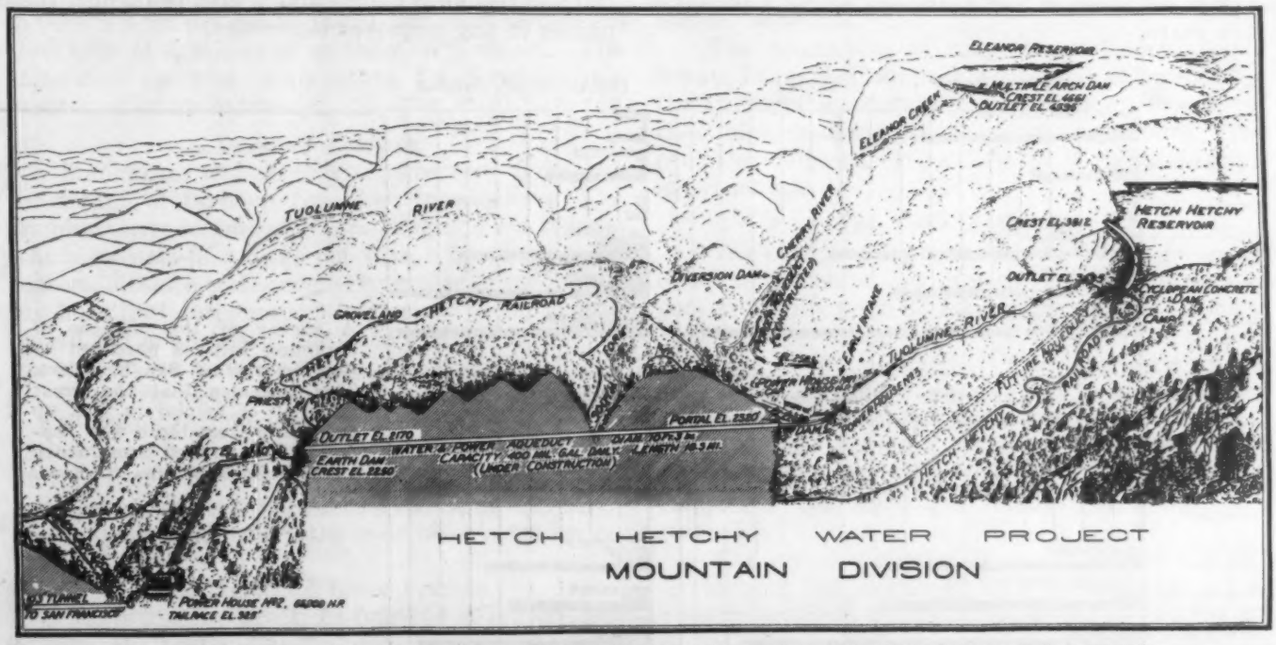
reinforced concrete pressure conduit, which is to be laid along a bench, which is now partially excavated, to the intake portal, the concrete pipe and tunnel to form a continuous pressure conduit.

Moccasin Creek Forebay Reservoir —

The flow from the tunnel will be delivered directly into the forebay reservoir of the Moccasin Creek power house. This reservoir will cover an area of 50 acres, and will have a capacity of about 3,000 acre-ft., equivalent to 1,000,000,000 gal., although this estimate may be somewhat increased depending upon the location of the dam which has not been entirely, as yet, determined. The dam will have a height of about 150 ft. and will be an earth structure of the hydraulic fill type. Test holes have been sunk to determine the condition and depth of bedrock, which appears to underlie the site. The crest of the spillway in the dam is to be at El. 2250, or 80 ft. higher than the Priest outlet invert. The dam is at the south end of the reservoir, while the outlet to the power house penstock is at the opposite, or upper end. This outlet is to be at El. 2140, or 30 ft. below the Priest outlet portal and 180 ft. below the reservoir surface, when full.

Moccasin Creek Power Plant —

A concrete tower intake with necessary gate mechanism will be built to control the flow from the reservoir into the penstock, which for a distance of 1¼ miles will consist of a concrete lined pressure tunnel, passing under the ridge north and west of the forebay and emerging near the top of a knoll overlooking the power house site on Moccasin Creek. From the end of this tunnel a steel header, sealed



A profile drawing of the Hetch Hetchy project which shows the location of the Early Intake and the proposed Moccasin Creek power house

into the tunnel, will distribute the water to a number of pipe lines, which will follow the slope of the hill to the Moccasin Creek power house. As the tunnel and pipes will be continuous, the pressure at the power house will be due to the head measured from the surface of the reservoir. The total length of the penstock from intake tower to power house will be 1.9 miles. The maximum static head at the power house will be 1325 ft. The conduit being designed for a continuous flow of 400 million gallons daily, or 618 second feet, the output of the plant will be 66,000 h.p. On this basis it is proposed to install three units. In view of the large capacity of the forebay reservoir and hence the possibility of taking advantage of this reserve to meet the requirements of a variable daily load, i. e., a fairly low load factor, it is proposed, eventually, to increase the installation of this plant by 50 per cent.

It is planned to build a low dam in Moccasin Creek, forming an afterbay into which the water from the power house will be discharged, and from this small reservoir the water to be carried to San Francisco will be delivered into the second main tunnel unit. Until the San Francisco conduit is completed with a capacity for 60 million gallons daily (or if other points outside of San Francisco be supplied, 120 million gallons daily), the discharge from the power house will flow down Moccasin Creek to the Tuolumne, and that which is not sent on, after the conduit shall have been completed will continue to flow back to the Tuolumne. No construction work has been commenced on the continuation of the conduit line and cannot be until assurance of the necessary financial support by the sale of bonds, provided therefor, is had. Preliminary studies of routes and structures have been made, and rights of way for the San Joaquin valley pipe crossing have been negotiated for. Provided that active construction work can be started in the immediate future, it is estimated that the first unit of 60,000,000 gal. per day can be delivered in San Francisco within a period of five years.

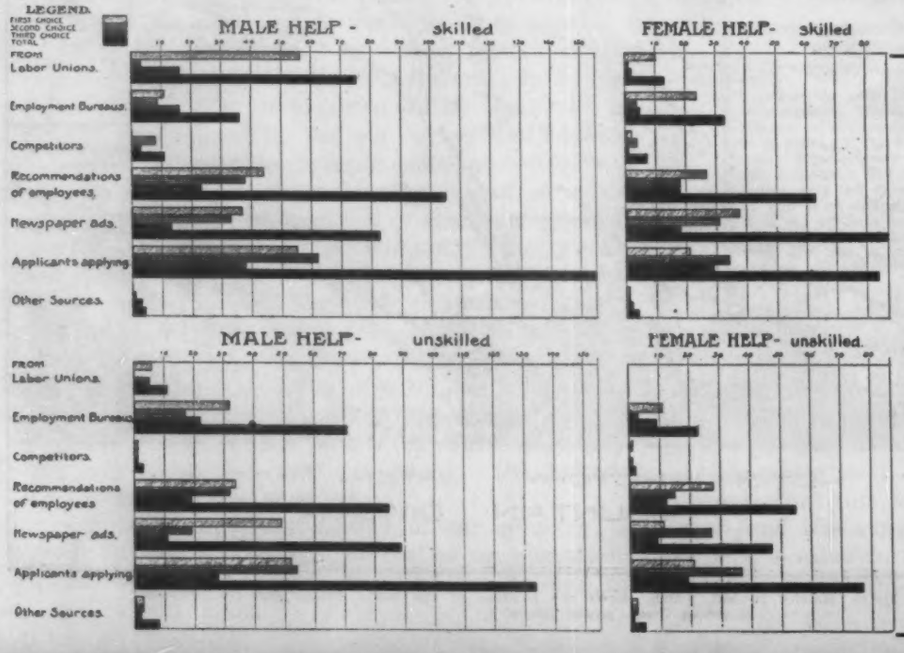
WHERE DO YOU GET YOUR HELP?

A recent survey of manufacturing firms in San Francisco by the Society for the Study of Employment Problems, as reported in the bulletin of the San Francisco Chamber of Commerce, has revealed the fact that most workers seek their own positions. The accompanying chart is the result of a questionnaire that was sent to all of the larger firms employing labor for manufacturing lines. Each firm was asked to designate a first, second and third choice.

The fact has been brought out that the men and women seek their own work and that the plant does not go after the worker. This is brought out by the long line showing the popular method of securing help is through the applicants applying for positions and through the recommendations of those already employed. The surprising fact is emphasized that employment bureaus are not used to such an extent as are these other methods. Newspaper advertising is resorted to only in the case of unskilled male and female help. Labor unions are evidently patronized where the male skilled help is unionized.

A study which would include sources of supply for office help and higher positions would be of great interest—and would undoubtedly reveal that here, as elsewhere, methods are more or less haphazard. No efficient means of bringing employer and employe together is in vogue, the group from whom the selection is made is usually limited by acquaintance or mere chance, and there is little guarantee that the best person is in the best position.

In this connection, the employment service the Journal of Electricity still maintains, the Service Bureau of the United Engineering Societies of San Francisco and the new bureau of occupations for men and women graduates which the University of California is organizing are all of interest as beginnings in the right direction. The Journal of Electricity keeps a file of applicants for positions of a commercial and technical nature and is glad to furnish these names to any employer interested.



A survey of the methods of obtaining help as practiced by the factories of San Francisco. This indicates that the great majority of employers pick up their help from those who happen to drift to their doors, much as a mollusk obtains its food.

ELECTRIC SMELTING ON THE PACIFIC COAST

BY W. L. MORRISON

(The high prices of the war developed the smelting industry in the West and created an opening for the use of the electric furnace. The absence of cheap power precludes a general development along this line in normal times, but there is a real opportunity in the smelting of silicon manganese as pointed out in this paper, which was given recently before the Portland sections of the A. I. E. E. and N. E. L. A. The author is manager and metallurgist of the Western Reduction Company of Portland.—The Editor.)

Electric smelting, aside from the steel and iron industry, is a new venture in the Northwest. At the present time there are plants located as follows:

Pacific Electro Metals Company, Bay Point, California.
Noble Electric Steel Company, Heroult, California.
Western Reduction Company, Portland, Oregon.
Bilrowe Alloys Company, Tacoma, Washington.
Seattle Smelting Company, Seattle, Washington.

These plants up till very recently were all producing ferro-manganese in some form or other.

Ferro-chrome, ferro-tungsten and ferro-molybdenum have been produced to some extent on the Pacific Coast, but at the present time I do not know of anyone carrying on operations; however, some of the plants on the coast are contemplating the manufacture of the above alloys.

Cheap Power a Necessity

Cheap power is one of the big factors which attract electrochemical industries. With very few isolated cases we have no cheap power on the Pacific Coast today for electrochemical manufacture.

When the cost of power becomes a large part of the manufacturing cost, in order to meet competition we must have competitive rates. For example, the power used in the production of ferro-silicon is so great per ton of metal produced that a difference of one mill per kw-hr. increase in power rate above what other manufacturers are paying, would put you out of business, other things being equal.

In the case of steel furnaces the variation of a few mills per kw-hr. makes very little difference, for there is used only 600 to 800 kw-hr. per ton of steel, while in the case of ferro-silicon we use 7000 to 9000 kw-hr. per ton of metal, and electric furnace steel sells at a higher price than ferro-silicon. The same may be true with other ferro-metals to a greater or lesser extent.

Types of Furnace

Manganese and chrome require very much the same kind of furnace for their production. The simplest form of furnace is the single phase furnace which consists of a large pot with a terminal in the bottom, either a water-cooled iron plug or a conducting hearth of carbonaceous material. A tap hole is placed at the bottom of the lined crucible for removing the molten metal and slag.

A carbon electrode is suspended in the pot forming the other terminal, which is movable to regulate the current in the furnace. Various modifications of this furnace are used, depending on the size of installation, the more common type being the three-phase furnace in which three or six electrodes are used.

The Acid and Basic Process

There are two practices followed in the smelting of ores, the acid and basic, with some slight modifications. These terms refer to the condition of the slag during the smelting operation. The acid slag is one in which the silica predominates, making a glassy slag. In the case of the basic slag, lime, iron, magnesium or some other such bases are present in greater quantity than that required to neutralize the acid silica. If the bases are in such quantity as to just neutralize the silica, the slag is termed a neutral slag.

The linings of the furnace should be such as are not readily attacked by the slag employed. For example, an acid slag requires a silica lining, with a basic slag a magnesite lining is used. When the operation is such that a carbon lining will not contaminate the product, this lining is to be preferred, as it will stand up very well under either acid or basic conditions.

The Production of Manganese

Both methods of smelting are followed in the production of manganese. The extreme acid practice (i. e., when little or no lime is used) gives a high silicon and low carbon content in the ferro, a type which before the war was imported from France to some extent.

The basic process in the production of manganese gives a lower silicon and higher carbon content. This is the more common form of ferro-manganese on the market.

Other Products

In the production of the ferro-chrome, the same holds as in the case of manganese, except in the case of the higher grades or so-called low carbon ferro-chrome products.

The production of tungsten and ferro-molybdenum is carried out in a somewhat different way from that of manganese and chrome on account of their high smelting points when nearly pure. The common alloys run from 70% to 85% tungsten or molybdenum.

The Type of Furnace

The process for producing the ferros is almost universally carried out in a single-phase furnace or pots averaging from 25 kw. to 100 kw., the commonest size being about 50 kw. These furnaces operate with the single electrode. The pots vary in size from 10-inch inside diameter up to 24-inch and from 24 inches to 36 inches high.

The pots are placed on large terminals either of iron or carbon material, and after the operation is completed the pots are removed and new ones started.

The metal is allowed to accumulate in the pots by tapping the slag from time to time through an opening punched in the lining of the pot at the top of the metal. The ore and flux is charged into the pot intermittently after the tapping of the slag.

At the end of the operation, when the pot has become too full for economic operation, it is removed and broken open and the button of metal is removed and crushed. The weight of the buttons varies in size from 500 to 3000 pounds.

One ton of tungsten or molybdenum requires 8000 to 10,000 kw-hr. per net ton of metal.

One net ton of metallic chrome (60-70% alloy) requires 10,000 to 14,000 kw-hr.

One long ton of 80% ferro-manganese requires 3500 to 5000 kw-hr.

Discussion

Q. Where does the Western Reduction Company obtain their electrodes?

They are equipped to manufacture them at their plant in Portland, in sizes of from 10 inches to 20 inches in diameter and up to 8 feet in length. There are two processes used in the manufacture of electrodes, the Rammed and the Extruding processes, and the former is used by this company. Colorado anthracite coal is calcined in a special electric furnace, and all of the volatile material is driven off. It is then ground fine and mixed with 15 to 20% of pitch. The pitch must not be too hard. It is then pressed into shape and again calcined. A socket and pin joint is made on them in order to connect them together.

Q. Where are the greatest deposits of ferro-manganese found and what was the price before the war?

From Japan, the Phillipsburg district in Montana, Russia, South America, and Macedonia. The price laid down in Germany before the war was $4 to $6 per ton, the freight alone from Phillipsburg to the East was $6 to $8.

Q. What controls the price of ferro-manganese in normal times and what were the prices during those times, also the war prices?

The blast furnaces control the price and the electric furnace cannot compete. The price in New York per ton before the war was $12 and during the war $250.

Q. Are there any chrome deposits in Oregon and is there any difficulty in obtaining it? What was the price before the war?

Transportation is the greatest problem, the main deposit being 14 miles from a railroad. The price in New York was $12.

Q. How much manganese is there used in ordinary steel castings?

Four to eight pounds to a ton.

Q. How much manganese is used in manganese steel?

One hundred and forty pounds approximately to a ton.

Q. What does manganese do to ordinary steel?

It adds to its tensile strength and eliminates "blow holes," but makes it so it cannot be machined. The only way to work it is to grind it.

Q. Is there any advantage of smelting in the West over the East?

As it takes 2 to 3 tons of ore to make a ton of steel the freight rate helps the West. If power could be obtained for $18 per h.p. per year it could compete.

Q. Do you see any field for electric smelting in the West?

Yes, the smelting of silicon-manganese.

Q. What is the load factor of your furnace?

95% or better, on 25 cycles.

Q. What is the power factor?

95% to 96% on 25 cycles.

Q. What is the best type of furnace for iron smelting?

The three-phase furnace and about 60% of those in use are three-phase. With the one-phase furnace the lower contact burns off and the metal goes through the bottom of the furnace. With two electrodes the bath gets easily carbonized. With the induction furnace, the power factor is low and the radiation losses are great. The electrode loss of a three-phase furnace is about 8%. The best voltage is 60 to 70 volts. If higher voltage is used, too much volatilization is produced.

Q. Is the current balanced between the phases of a three-phase furnace?

With manual control it is balanced to within 3% except on starting, and this is seldom necessary as the furnaces are fed continuously from the top and tapped at the bottom without any disturbance of the electric regulation.

Q. Why don't the electrodes short circuit?

Due to the low content of the ore when cold, when the slag gets fluid at about 3300 degrees F. the resistance becomes constant. The circuit is also protected by a circuit-breaker for emergencies.

ACHIEVEMENTS OF WAR APPLIED TO PEACE

With the cessation of war the Germans, it is said, will never be able to realize what the full force of America's military might would have been, or the many devices and methods that were the result of American ingenuity, for the War Department is keeping the best of these a profound secret.

At the same time great good for the future peaceful pursuit of industry in this country and for the saving instead of killing of men has come out of this welter of death-dealing experiments, is the claim of the Bureau of Mines. Certain experiments with delicate instruments known as microphones and geophones, in order to detect the direction and the distance of enemy mining work in tunneling and the location of enemy artillery no matter where placed, has disclosed that these same instruments can be of use in determining the location of men entombed in mines following disaster. It is expected that, if the men have the presence of mind to make even a slight noise, the rescuers listening with these devices will be able at once to locate the men and begin the rescue work. Men thus entombed have been known to live for a week or longer under such circumstances, the rescuers being unable to find them. Other men have died before they could be located. The bureau will equip its rescue cars as soon as possible with these devices.

The war experience of the bureau is going to help peace industries in still another direction. The coal experts, eager to do their share in winning the war, were assigned to the testing of boilers to be used in the ships of the Emergency Fleet Corporation. Speed and the saving of coal were demanded. The result was that the experts so changed the design of the boilers that the coal heretofore necessary to send the ships along for six miles was sufficient to carry them seven miles. This great saving will be available in peace times.

Through its investigation of natural gases the bureau with the cooperation of the Army and Navy conducted important work relating to balloon gases. This work included the development of certain products for use in balloons that can be obtained from natural gas. No more can be said about this work at this time.

It was soon found that there would be a tremendous demand by the military authorities for the so-called war minerals. With the havoc wrought by the submarines, the world was short of shipping and the United States was informed that these minerals should come from American mines, many of which were either inadequately developed or not developed at all, because this country had been depending on foreign sources of supply. The bureau was called upon to furnish these minerals and within a few months there had been developed a sufficient quantity of some to supply all war needs and a surplus of others. It is now said by the bureau that the metal mining industry has received such an impetus by this war demand that it will be in peace times a much greater and more prosperous industry than ever before. "America has been discovered by Americans," said Secretary Lane when he heard how the industry had responded to the war call.

THE AWAKENING OF A NEW NATION

(Much of northern and central China is ready to pass from the agricultural to the industrial stage. The development which the war has brought about opens a period of singular opportunity. This comprehensive survey of the industries, resources and trade conditions in China, as arranged by the Asia Banking Corporation, will be of interest to all engineers and business interests who are looking toward the Orient with new enterprise.—The Editor.)

Sunset on the Yangtze Kiang—the great water way of northern China. This river is 3,000 miles long and navigable almost its entire length.

WHILE the present war has been the most destructive in the experience of mankind, it has also been one of the most powerful constructive elements the world has ever known. It has affected, directly or indirectly, every nation on earth, and, through the dire necessity occasioned by it, has energized practically all humanity. The impetus, too, which it has given to nearly all peoples will not have been spent by the time peace is declared, and unquestionably will result in a great world-wide development.

The possibilities, indeed, are plainly forecast today in China, which is one of the very richest fields awaiting commercial, industrial and financial cultivation. The steadily increasing influx of foreigners into China since the beginning of the war is significant of vast future potentialities, as well as of the fundamental and far-reaching political and social changes which are transforming China into a country of attractive business and investment opportunities. Ample evidence of the growing realization of China's commercial possibilities is to be found in the latest official reports which disclose that there were in China in 1917, 7,055 foreign firms and 220,485 foreign residents, as compared with 4,742 firms and 185,613 residents in 1914.

Shanghai

While China has more than 2,000 miles of coastline, it has very few harbors suitable for trade purposes, chiefly because they lack adequate means of communication with the interior. Shanghai, with a population of about 700,000, is the only port which has a natural waterway extending far into the interior of China. It is located on the Whang-pu which runs into the estuary of the Yangtze River which opens up the central portion of China to the trade of the world. It is navigable, except during the dry season, to Hankow, for a distance of 600 miles for ocean steamers and for small steamers to Ichang, a distance of more than 900 miles, and for small river boats to a distance of 1,700 miles from the sea coast.

The valley of the Yangtze River is the only one of material size in China and in extent is somewhat comparable to our great Mississippi Valley, except that it is broken up into basins by intersecting mountain ranges. The basins of this valley are among the most fertile sections of China. In addition to the Yangtze River, Shanghai is connected with the great agricultural region extending northward 750 miles, by means of the Yangtze River and the Grand Canal reaching Tientsin, and also by a railway line which extends from Shanghai through Nanking, by ferry to Pukow, Tientsin, and Peking. Shanghai ranks as the first port of China. Approximately 40% of the entire trade of the country passes through this port, the value of which in 1917 amounted to over 407 million Waikwan Taels (as the rate of exchange for that year, one Tael equals approximately $1.03).

FROM THE CANTON WALL

Canton is the great interior center of the south—a district which has been prominently featured, although northern China holds perhaps the greater possibilities for western development.

Shanghai is primarily the distributing center of China and in addition, the most important industrial center. The main industries are cotton spinning and weaving, and that Shanghai will be the center of the cotton industry of the Far East is indicated by the shifting of other cotton plants from less convenient places to that city. Another important industry is silk filatures, which gives employment to about 20,000 workers. There are also extensively developed soap works, chemical works, paper and flour mills, tanneries, oil mills, match factories, tobacco factories, printing and lithographic works. Large engineering and shipbuilding establishments form very conspicuous features of this place, and it is interesting to note that the United States Shipbuilding Corporation has recently closed a contract for the construction of several vessels with a Shanghai shipbuilding company. All the materials, except 40,000 tons of plates, are to be obtained in China.

Peking

Peking, the capital of China, has a population of over 1,000,000. In addition to being a political center, it serves as a commercial focus on account of its good communication with other parts of the country. Railways connect it directly with the great commercial cities, such as Kalgan, Tientsin, and Hankow. In addition to the railways, many roads radiate from Peking, the longest being that to Lahassa,

the capital of Tibet, which is 4,713 miles, and the daily arrival of caravans adds to the picturesqueness of the city. Water traffic is unloaded at Tungchow, a few miles to the east, and is transported by cart over a stone road to Peking. Tungchow is on the Pei River and is connected directly with Peking by an artificial canal.

Tientsin

Tientsin, with a population of about 800,000, situated at the junction of the Hai River and the Grand Canal, and a railway center for many lines, is, in both a commercial and industrial sense, the most important city of North China. Through the junction of the Peking-Mukden and Tientsin-Pukow railway lines and the proximity of the Peking-Hankow line, Tientsin is in touch with the Lower and Middle Yangtze regions, with Peking, Korea, Manchuria, and Europe. A large shipping trade is carried on from March to December, both in Chinese and foreign vessels. The leading industries are the making of Chinese rugs and carpets, wool cleaning and packing, braid making, bristle sorting, salt production, and the tea transit trade, developed by the Russians. The iron industry is also becoming an important factor. The chief exports are raw cotton and wool, goat skins, pig bristles, linseed, ground nuts, spirits, medicine, beans, etc. The chief imports are cotton goods, cigarettes, kerosene, machinery, railway material, sugar, and flour.

Hankow

Hankow, with a population of 800,000, is the leading commercial city of central China, and is probably destined to be the Chicago of China. It is located about 600 miles from the sea on the left bank of the Yangtze River, at the limit of navigation for ocean-going steamships, and by these it is attainable for some nine months of the year. Small river steamers and boats are able to navigate over 1,000 miles farther up the Yangtze River to the west of Hankow. Through the Yangtze River and the Poyang Lake, Hankow is in direct communication with the resourceful provinces of Kiang-so to the south. The southern terminus of the Peking-Hankow Railway, and the important northern terminus for the Canton-Hankow Railway, the Hankow Railway and the Hankow Szechwan Railway, which is under construction, will make this port the leading city of central China. Hankow, Wuchang and Hanyang, known as the Wuhan group of cities, with a population of 1,300,000, form the commercial, industrial and financial heart of China and occupy a position unique both commercially and economically. It is estimated, in fact, that Hankow is the distributing point for more than 80,000,000 people.

The tea industry has become the principal one of Hankow in recent years. There have been established also match and albumin factories, and the curing of hides is carried on extensively. Hankow's main exports are beans, bristles, flour, furs, hides, iron goods, silk, tea, and wood oil. The imports are rice, sesamum seed, tobacco, silk, sugar, medicinal plants, musk and furs from the interior of China; and from abroad, cotton goods, sugar, kerosene and sundries.

Harbin

Harbin, with a population of 65,000, is the most important trading center in Manchuria. Its location on the Sungari gives it direct water communication with Vladivostok. Here also is the junction of the Chinese Eastern Railway with the South Manchurian

THE STREETS OF HONGKONG
A Southern China port but characteristic of the way the Occidental transforms the districts he develops

Railway. The former road is a link in the great Trans-Siberian system, while the latter line leads to Dairen and Port Arthur. Both roads have tributary lines in Manchuria, and Mukden is the junction point of the South Manchurian Railway with the lines leading into China proper and Korea. In March, 1916, Russia obtained permission to build a road northward from Harbin by way of Mergen to Blogoveschchensk with a branch line to Tsitsihar. As an important gateway into Mongolia, Harbin will benefit by whatever industrial development may take place in this province. Harbin is the center for all trade routes in Northern and Central Manchuria and the great center of foreign trade exchange, particularly between Russia and China. Foreign goods, as well as locally manufactured products, are not only consumed on the spot in large quantities but are also in demand in the other markets dependent on Harbin. It is the center of a great expanse of territory in which the soya bean is extensively cultivated.

The goods in demand there include textile fabrics, cigarettes, beer, spirits, etc. Harbin is a large export center of all kinds of grain, soya beans, and

eggs, and there is an increasing exportation of meat, hides, wool, and kindred products.

Resources

The territory has a variety of resources and a variety of climatic conditions, varying from the cool temperate section of northern Manchuria to the subtropical section of the area tributary to Hankow and Shanghai in the south. Manchuria in the north is primarily an agricultural section, resembling Dakota in climatic and physical features, with an area greater than New York, Pennsylvania and Texas combined. The principal agricultural products are beans, maize, millet, wheat, wool, tobacco, hemp and rice. The agricultural products which figure mainly in the export trade are beans, bean cake, bean oil, and cereals.

Manchuria has large areas of virgin forest, but adequate transportation is lacking to make the timber resources of much commercial value. Mineral wealth is abundant, southern Manchuria being one vast coal field. The Fushun mine is probably the best known of those now in operation, with 20,000 workers. It is estimated that the seams which are being worked contain approximately 800,000,000 tons of easily accessible coal. Coal is found quite generally in the northern part of Manchuria, but primitive mining methods and lack of adequate capital have prevented the full development of coal mining in this section.

China, at its present stage of development, is mainly an agricultural country. The great plains of the northeast form a great half circle with the Shantung peninsula at the center, and the extensive flood plains of the lower Yangtze constitute the only large plains areas in China, which comprise scarcely one-eighth of China's surface. Elsewhere only the narrow flood plains and small deltas relieve the usual monotony of the slope and mountain regions. The northern or great plains constitute for the most part the Hwang-ho delta, reaching inland for 400 miles. The Yangtze plain extends inland in a series of basins for 600 miles, separated from the great northern plains by ranges of hills and mountains. These two plains coalesce, however, in the east so that continuous wide plains extend from Hang-Chow to Peking, a distance of about 750 miles. The Yangtze plain extends inland 1,000 miles. These extensive plains equal in area that of Ohio, Indiana, Illinois, and Kentucky, and constitute the great agricultural resources of China. They now support an enormous population—fully 40% of China's total—and furnish food and raw materials for export.

Among the most extensively cultivated agricultural products of northern and central China are soya beans, rice, cotton, tea, silk, ground nuts, hemp, jute, castor oil, apricots, etc. Of farm products, eggs, egg albumin, feathers, etc., are exported in great quantities. Animal products such as furs, wool, skins and hides, goat skins, and bristles form a very important part of China's exports.

Mineral Resources

Generally speaking, there is a variety of mineral resources in most of the provinces of China and scientific surveys are almost sure to reveal mineral deposits now unknown, even to the Chinese. The most abundant mineral deposits of the country consist of coal and iron. The largest coal area in northern China consists of Shan-si field, occupying the province of that name but extending into the neighboring provinces of Honan Chi-li, Shan-si, and Kan-su. This territory lies westward of the railroad line extending from Hankow to Peking. It has been estimated that in this field there were more than 30,000 square miles of coal. The coal of the eastern section is mainly anthracite, while that of the western part is bituminous. It is asserted by experts that there is sufficient fuel there to supply the whole world for thousands of years. The anthracite area is estimated to be larger than that of Pennsylvania. Near Peking there are several coal fields accessible to railroads and to sea transportation which are being extensively operated at present. To the south of Hankow is another important coal area located in the province of Kiang-si which is being mined now to supply the Government iron works established at Hankow.

Like coal, iron is widely distributed in China, and is often found closely associated with it. Honan, to the north, and Kiang-si, to the south of Hankow, are reported to be rich in iron ore. The most important iron plants are those of the Hanyehping Company, which are located at Hankow, and which produce approximately 150,000 tons of pig iron yearly. The extent and quality of the iron ore deposits of China are not definitely known. It is the opinion of many experts that the reserves of iron in China are quite similar to those of the United States and Brazil. Antimony also appears to be very abundant in Honan and Kiang-si, and there is considerable export trade of this metal.

Clay deposits are found quite extensively in the northeastern section of the province of Kiang-si and furnish material for the important pottery industry that has grown up there. Among other minerals mined in China are gold, silver, sulphur, asbestos, tin, lead, etc.

The Awakening of a Nation

China has occupied a place of more or less complete separation from the rest of the world. The mountain areas of the Northwest, West, and Southwest have impeded communication with peoples of those sections, while the great expanse of the seas has restricted the relations with the peoples across the water. Thus the Chinese, of all the large nations, have been allowed to live a life of isolation which, in certain respects, has led to stagnation, rather than growth of industry. But China is gradually awakening and is opening for the development of her immense resources, of which she has little definite knowledge.

A considerable portion of central and northern China has passed through the agricultural stage, and is ready to enter the industrial stage. The supply of cheap and industrious labor, a variety of natural resources, and sufficient food immediately available, constitute a remarkable combination of economic factors awaiting the touch of industrial and financial leadership.

ARRANGEMENT OF POWER CONDUCTORS

(Concrete recommendations for the spacing of power lines as made by the California Committee on Inductive Interference. Extremely technical mathematical calculations and six years of experimentation and study are back of this report, of which a portion of the results are here given. The entire report has been presented in its final form to the California Railroad Commission.—The Editor.)

The arrangement and spacing of the conductors of power circuits are of importance in determining (1) the unbalances or inequalities among the capacitances of the conductors to ground, which cause residual voltages and currents, and (2) the intensity of the inductive effects produced in communication circuits by the balanced voltages and currents of parallel power circuits. For sections of line within limits of parallels, consideration of the inductive effects should in general control rather than consideration of the capacitance unbalances. For sections of line outside the limits of parallels, consideration of capacitance unbalances should be given the greater weight, particularly for circuits operated without grounded neutrals.

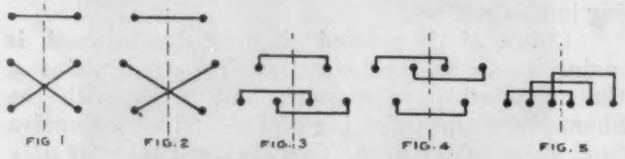
The figures and comparisons given herein apply to nontransposed circuits, but the comparisons of different configurations hold also for transposed circuits, provided the circuits are transposed identically. If there were no irregularities or inexactnesses to impair the effectiveness of a transposition system, it would be possible theoretically, neglecting the effect of phase change and attenuation, to obtain a perfect balance by means of transpositions, irrespective of the arrangement of the conductors. Practically, however, circuits even when carefully transposed have a material resultant unbalance, particularly at the frequencies of the higher harmonics, and this unbalance is proportional to the unbalance characteristic of the circuit configuration. In a similar manner the resultant induction due to a power circuit is proportional to the intensity of the induction characteristic of the configuration. Configurations differ widely in respect to their characteristic unbalances and intensities of induction, some arrangements, particularly of twin circuits, giving fully 90 per cent less unbalances or induction than others.

Effect on Capacitance Unbalance

In general, the capacitances to ground of the conductors of a non-transposed multiconductor circuit are unequal, the magnitude of the percentage unbalances being determined by, and therefore characteristic of, the configuration of the circuit. This "characteristic unbalance" is an important factor in determining the residual voltage of a circuit isolated from ground, and in determining the residual current of a grounded neutral circuit, in so far as such current is caused by the line itself. Taking as a measure of the characteristic unbalance, the residual voltage of a short, uniform, nontransposed circuit without metallic connection to ground and energized with unbalanced three-phase voltages between conductors, termed the "characteristic residual voltage," the following table affords a comparison of various configurations of single-circuit power lines over the practical range of cross-sectional dimensions.

Characteristic Residual Voltage; Per Cent of Balanced Three-Phase Voltage Between Conductors	
Configuration.	
Equilateral triangle	0.5 to 4
Vertical	6 to 11
Horizontal—	
Symmetrical	5 to 9
Unsymmetrical	7 to 11
Isosceles triangle—	
Base horizontal	0 to 8
Base vertical	0.5 to 9
"L"	2 to 6
Inverted "L"	4 to 7

Triangular circuits have the smallest unbalances and characteristic residual voltages. Symmetrical horizontal and vertical circuits are about alike, the vertical having slightly the greater, and unsymmetrical horizontal circuits have the largest. The characteristic residual voltages of symmetrical horizontal and vertical configurations are from 2 to 8 times that of a corresponding equilateral triangular circuit, depending upon the spacing and height of the conductors. The characteristic residual voltages of unsymmetrical horizontal circuits are about 20 per cent greater than those of symmetrical horizontal circuits. They may, however, be reduced to those



METHODS OF INTERCONNECTION GIVING MINIMUM RESULTANT CAPACITANCE UNBALANCES.

of the symmetrical cases if the position of the intermediate conductor is alternated so that its average position is midway between the two outside conductors. (If the circuit is transposed this condition should be fulfilled in each section between transpositions.)

The characteristic residual voltages of equilateral triangular circuits are closely proportional to the conductor spacing, but the conductor spacing has but little effect in the cases of vertical and horizontal circuits.

With twin-circuit lines it is possible to connect the two circuits so that their unbalances tend to neutralize, giving smaller resultant unbalances among the capacitances of pairs of interconnected conductors than the unbalances among the conductors of individual circuits. For twin circuits of any type the maximum unbalances occur when conductors symmetrically located with respect to an intermediate vertical plane are at a common potential. This arrangement should be avoided in all cases.

For circuits of the vertical type, or with top and lowest conductors in a vertical plane and middle conductors displaced outward a small distance, the minimum resultant unbalances are obtained when the top conductors of the two circuits are at common potential and the middle and lowest conductors of one circuit are at the potentials of the lowest and middle conductors respectively of the other. (See

Figs. 1 and 2.) For triangular and horizontal circuits the minimum resultant unbalances are obtained when similarly placed conductors of each circuit are at common potential. (See Figs. 3, 4 and 5.) These figures are cross-sectional diagrams, the conductors at common potential being shown as interconnected.

The resultant unbalances with these arrangements are in some cases less than 10 per cent and in general less than 50 per cent of those with the worst condition described above. The arrangements indicated by Figs. 1, 2 and 3 give resultant unbalances of the order of magnitude of those of single-circuit equilateral triangular lines of corresponding conductor spacing, while those of Figs. 4 and 5, in general, give greater unbalances. In all cases the characteristic residual voltage is taken as the measure of the unbalance.

Where ground wires are used or in cases where unsymmetrical circuits or more than two circuits are involved, special study is necessary to determine the best arrangement.

With twin circuits of any configuration if the interconnection giving maximum unbalance be altered by transposing the interconnecting wires the unbalance is halved. The two possible interconnections resulting from this procedure are shown in Fig. 6. This plan is useful when there is a doubt as to the best arrangement.

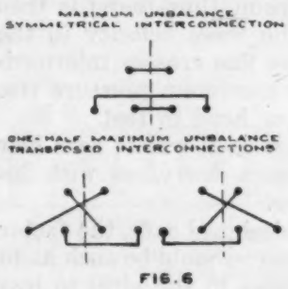


FIG. 6

To obtain the greatest advantage of arrangements giving small unbalances the twin circuits should be interconnected at both ends of the line and at intermediate substations where practicable. In cases where twin circuits are paralleled on the station side of transformer banks but can not be interconnected on the line side, it is still advantageous to fix the phase relation of the conductors as if they were to be interconnected for minimum unbalances.

When transposing twin-circuit lines to secure capacitance balance, the two circuits should be transposed at the same points and care should be taken to secure the condition for minimum unbalance in each section of line between transpositions. (See Fig. 9, below.)

The foregoing facts have an important bearing on the number of transpositions required to adequately balance different types of circuits, more frequent transpositions being necessary in circuits of large characteristic unbalances.

Effect of Induction from Balanced Voltages and Currents

The type of power circuit producing the least inductive effects in a parallel communication circuit depends upon the spacing of the conductors and the separation from the communication circuit. In general, for all types of circuit, an increase in the spacing of the power conductors causes a proportionate increase in the magnitude of the inductive effects. Excessive spacing should therefore be avoided. On the other hand, ample spacing to prevent short-circuits or grounds, due to snow, wind, birds, etc., is essential from the standpoint of inductive interference, as well as from that of power service.

For lines separated by the width of an ordinary highway, a vertical type of power circuit, in general, causes the smallest inductive effects, while the horizontal types cause the greatest effects, the triangular types being intermediate in this respect. The relative merits of different configurations vary somewhat with the separation of the two classes of lines and with the dimensions of the power circuit, depending also upon the relative importance of the balanced voltages and currents in producing induction.

For low-voltage horizontal lines, 15,000 volts or less, a symmetrical arrangement of the conductors is better than an unsymmetrical arrangement. For lines of any voltage, if an unsymmetrical arrangement is used, the intermediate conductor should be displaced toward the communication circuit. Hence, unsymmetrical horizontal power circuits along highways should have the intermediate conductor placed on the side of the poles toward the road, where communication circuits are, or may be, located on the opposite side of the road.

When two or more synchronous circuits are carried on one line it is possible to interconnect the conductors of the two circuits or otherwise fix their phase relations so that a partial neutralization of the inductive effect takes place. For twin circuits of the vertical type, or with the top and lowest conductors in a vertical plane and the middle conductors displaced outward a small distance, the most favorable condition is in general, to have the diagonally opposite conductors at a common potential. (See Figs. 7 and 8.)

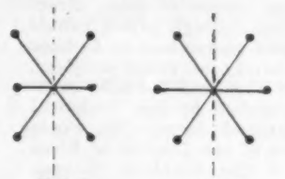


FIG. 7 FIG. 8
METHODS OF INTERCONNECTION CAUSING MINIMUM INDUCTIVE EFFECTS

For circuits of other types the most favorable method of connection varies with the spacing and height of the power conductors and with their position relative to the communication circuit. Thus it is not possible to give a general recommendation, since special study is required in each specific case to determine the most advantageous method of interconnection. Special study is also required for lines carrying more than two circuits of the same or different voltages, for unsymmetrical double-circuit lines, and in cases where ground wires are used.

In transposing twin-circuit lines to neutralize the inductive effects in parallel communication circuits, a similar precaution should be observed, as noted above, with respect to transpositions for capacitance balance. (See Fig. 9.)

Recommended Configurations

Taking into account both effects above discussed and practical considerations of construction, the equilateral triangular configuration (either the "horizontal-base" or "wishbone" type) is in general recommended for single-circuit power lines; and the vertical configuration (including type of construction

with middle conductors displaced slightly outward from vertical plane of the other two) for twin-circuit power lines.

The method of transposing twin vertical lines to preserve the best relation of interconnected conductors both outside and inside limits of parallels is

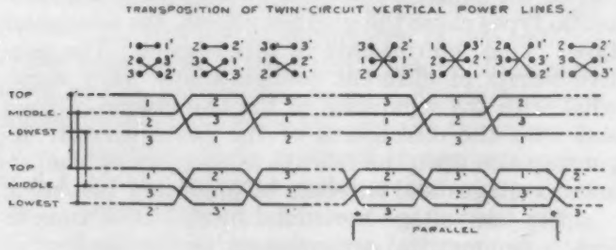


FIG. 9

* THESE TRANSPOSITIONS IN CIRCUIT LAST INSTALLED OCCUR ONLY AT THE ENDS OF THE PARALLEL AND ARE FOR THE PURPOSE OF CHANGING FROM THE BEST ARRANGEMENT OUTSIDE THE LIMITS OF THE PARALLEL TO THE BEST ARRANGEMENT INSIDE THE LIMITS OF THE PARALLEL AND VICE VERSA

illustrated in Fig. 9, one barrel being shown in each location.

Reference

Further information concerning this subject will be found in Technical Reports Nos. 51, 64 and 65 of the Joint Committee on Inductive Interference. These and other technical reports are to be published by the State of California.

CHARTS FOR CALCULATING WATER HAMMER

(The latest of a series of fifty-two diagrams of practical use for the engineer and electrical man. The series includes: Bearing power of piles, direct current wiring, flow of water through pipes, canals in earth, stadia measurements, power loss in 3-phase transmission and a wide variety of other subjects. They have been prepared by Manifold & Poole, engineers of Riverside, and published by the Technical Publishing Company in handbook form. Mr. Poole will be recognized by readers of the Journal of Electricity as chief engineer of the Southern Sierras Power Company.—The Editor.)

The subject of water hammer is one of the most important in the design of pressure pipes, and yet in many cases is hardly taken into account, principally owing to the fact that engineers are not quite in accord as to the effects of the sudden closing of a valve, and also on account of the amount of labor required to apply the formulas.

Herewith we present two diagrams designed to lessen the labor of calculating the effect of water hammer, and thus to indicate suitable factors of safety in the design.

Diagram No. 50 gives the velocity of wave for steel pipes of varying diameters and thicknesses, and is based on the formula,

$$a = \frac{12}{\sqrt{\frac{W}{g}\left(\frac{1}{K} + \frac{D}{tE}\right)}}$$

where a = wave velocity in feet per second,
W = weight in pounds of a cubic foot of water.
g = acceleration due to gravity = 32.2 ft. per sec.
K = factor of compressibility of water.
D = inside diameter of pipe in inches.
t = thickness of pipe in inches.
E = modulus of elasticity of steel.

In order to obtain results from diagram No. 50, connect a line from diameter of pipe through the thickness and find intersection with a = wave velocity. It will be noted there is considerable variation in the wave velocity produced. In order that this may be a minimum, the efficiency of joint used should be as high as possible, as this will have the effect of making the plates thinner, and thus producing a slower wave. There is also a saving in the weight of the pipe, also the use of high tension steel would be indicated for same reasons.

Diagram 50½ gives the maximum possible rise or fall in pressure due to water hammer, and solves the equation—

$$h = \frac{aV}{g} = \frac{48aQ}{D^2\pi}$$

where h = maximum pressure rise or fall.
a = velocity of wave as found in No. 50.
V = velocity of flow in pipe.
g = acceleration due to gravity.
Q = flow in second feet.
D = diameter of pipe in inches.

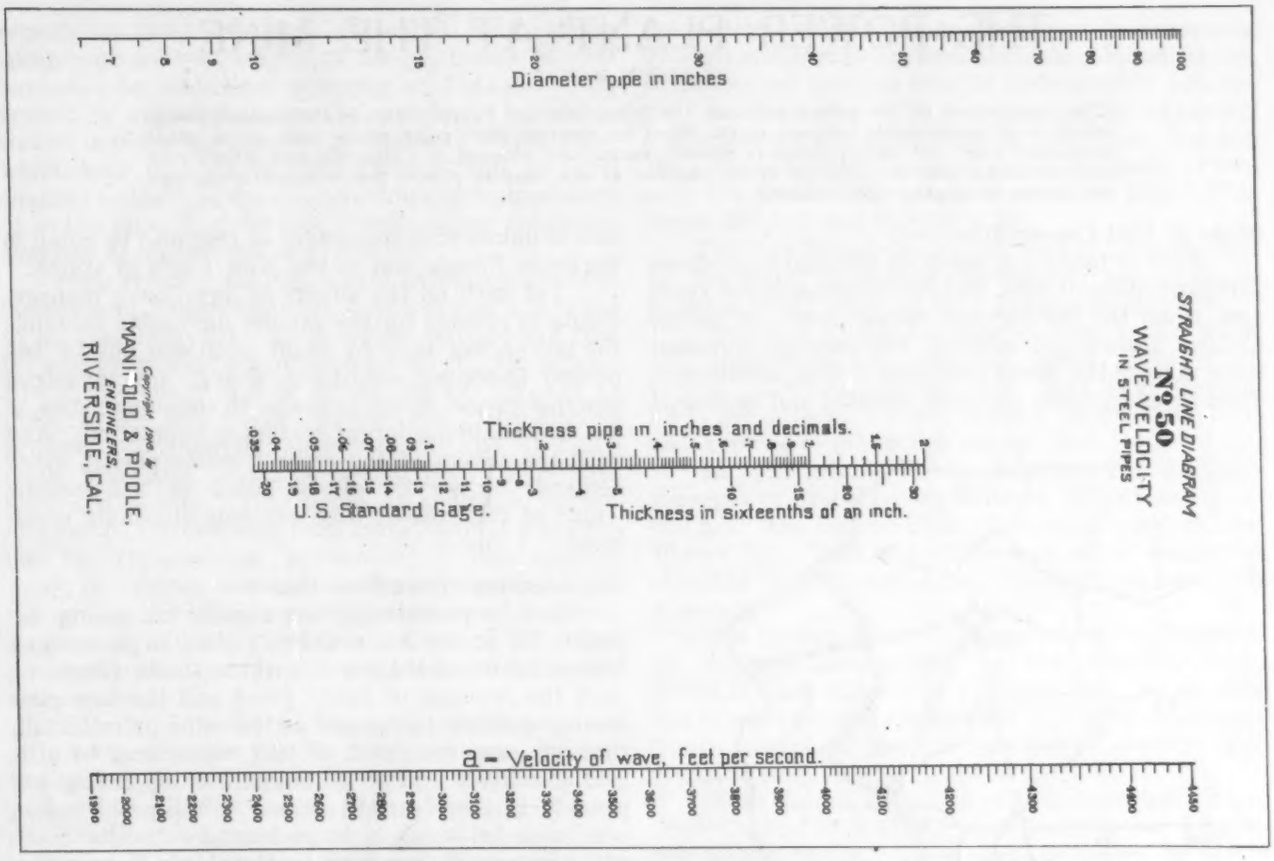
This diagram is divided into two parts, the left hand section giving the velocity in pipe for a given flow in Second Feet. The point thus found is then used in conjunction with the wave velocity in the right-hand section and where line crosses intermediate scale will be found the maximum pressure rise in pounds per square inch, or head in feet.

In looking over this diagram it will be seen how rapidly the maximum pressure increases with increase of velocity in the pipe.

In order that a pipe be designed safe, the factor of safety against water hammer should be such as to limit the maximum fibre stress in the steel to less than the elastic limit of the material. In the following table the method of figuring is shown. Assuming a diameter of pipe 48 inches to carry 60 second feet of water, Ultimate Tensile Strength of Steel 60,000 pounds, with an elastic limit of 50,000 pounds per sq. inch.

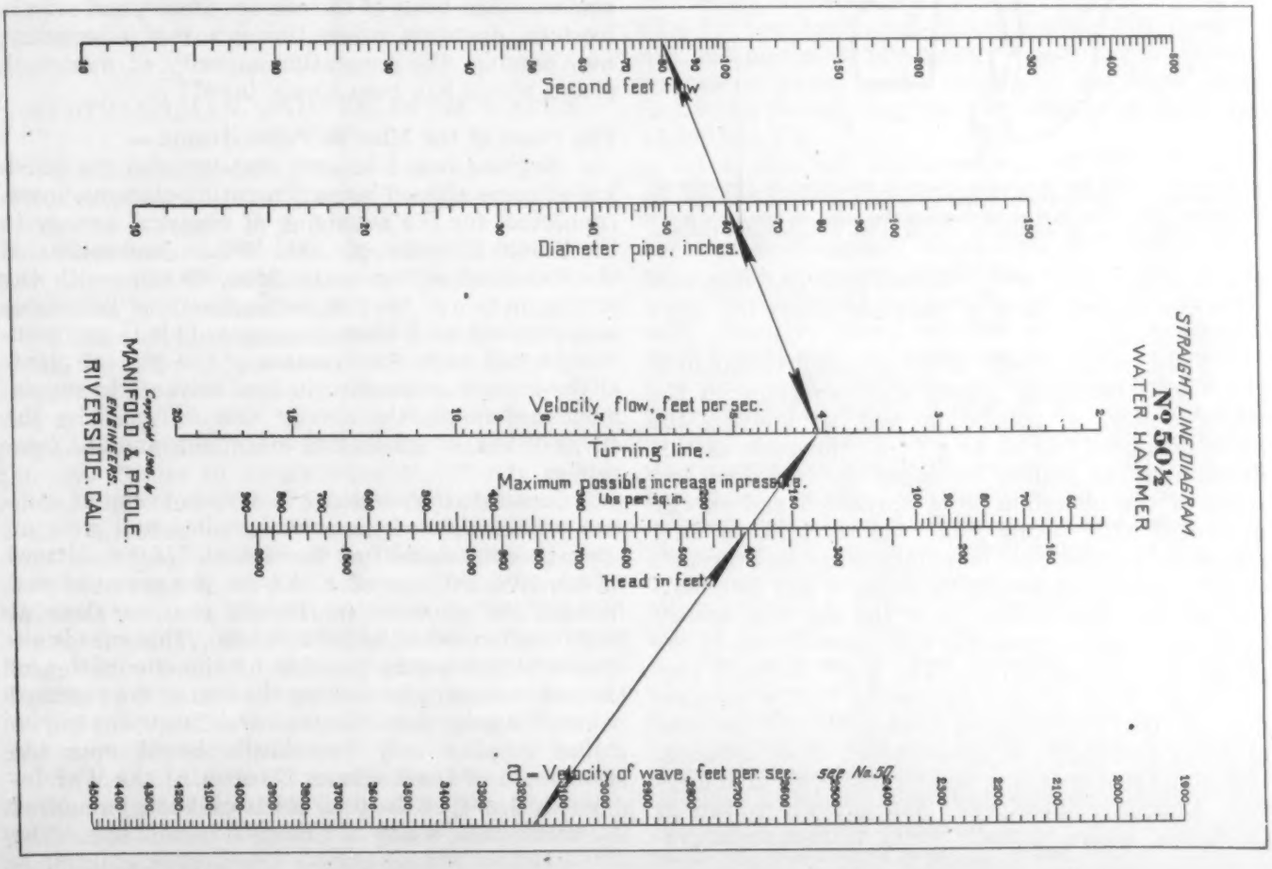
1—Eff. of joint.	2—Thickness of steel.	3—Wave velocity from No. 50.	4—Velocity of flow from No. 50½.	5—Increased head from No. 50½.	6—Head to stress to elastic limit.	7—Dif. cols. 5 and 6 static head at which to lay pipe.
70%	1/4″	2750	4.73	403	505	102
"	5/16″	2960	" "	435	631	196
"	3/8″	3120	" "	457	757	300
80%	3/8″	3120	" "	457	866	409
"	7/16″	3240	" "	475	1010	535
"	1/2″	3350	" "	491	1155	664
"	9/16″	3440	" "	505	1300	795
"	5/8″	3530	" "	518	1445	927
"	11/16″	3600	" "	529	1590	1061
"	3/4″	3660	" "	535	1735	1200

It will thus be seen that while the greatest shock takes place at the lower end of a pressure pipe, the thinner sections of the pipe may be more dangerously stressed. The writer has in mind a pressure pipe where it was found necessary to install a relief pressure valve at a distance of over 4000 feet from the lower end, and in this position was entirely satisfactory. The installation of air chambers and relief valves at critical points on the line will be found of great advantage in reducing the effects of water hammer.



STRAIGHT LINE DIAGRAMS FOR USE IN CALCULATING THE EFFECT OF WATER HAMMER

The latest two diagrams recently added to the set of useful charts for engineering computations published by the Technical Publishing Company. The explanation of the method of use is to be found on the opposite page.



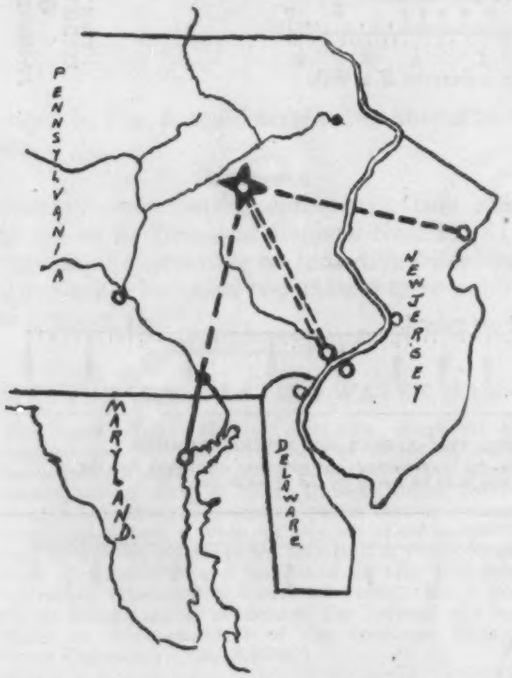
THE POWER PLANT AT THE MINE

BY ROSS B. MATEER

(The experiment of the power plant at the mine, in which Pennsylvania is the pioneer, is one which is of considerable interest to the West in view of the lignite mines soon to be made available. One such power plant is already tentatively planned in California and others may take advantage of the economy of the method at one time to relieve the transportation, fuel and power shortage.—The Editor.)

Steps in Fuel Conservation —

What is today a problem of national importance —conservation of fuel, had its inception some years ago, when the far-sighted managements of public utilities maintained efficient engineering organizations to solve the power problems of their consumers. Then by educational methods, isolated and inefficient steam driven units were frowned upon and displaced with the flexible service supplied from the large central station.



A proposed system for developing power at the mine in Pennsylvania. The line now in existence is indicated by a full line, the new development by dotted lines. This system of locating the plant at the mine means a great saving in actual expense as well as in the transportation facilities.

Then, as now, much of the energy distributed to the varied industrial plants was generated in the larger centers of population and with either the "black diamond" or oil as a fuel. However, as this demand on the station increased the turbulent torrents of the mountain were harnessed and energy generated with "white coal" was carried, by long transmission lines over mountain range and through desert, to suitable switching stations and distributing centers. The utilization of the potential energy of the mountain stream was but a second step in the program of conservation. The third forward step was made when certain aggressive utility managements sought and obtained from public service commissions the right to interconnect their systems. One of the problems now under consideration in England American intelligence had already solved in California, where virtually every transmission system is linked with the other; as may also be noted in northern Illinois and in the New England states.

Yet with all the efforts of aggressive managements to provide for the rapidly increasing demands for power, not only by plant additions but by improved operating conditions, energy for industrial power purposes is not available in such quantities as are desired, in our larger centers of population. And with the advent of the reconstructive period, other demands for service will be noted in the sections which at the present time are only sparingly populated.

The Location of the New Plants —

How to provide for the rapidly increasing demands for power is a problem. Shall large sums of money be expended for tidewater steam plants or shall the problem be fairly faced and the new generating stations be located at the mine or waterfall, that our resources, coal, oil and water, may be utilized effectively and at a minimum of operating expense? In the West the answer to the problem has been sounded—and in large measure "white coal" will continue to generate in the high Sierras the energy which will turn the wheels of industry—not only at the ore mine but in the metropolitan coast centers. But what of the eastern states, and even in western districts where through this emergency, now passing, the generating capacity of mammoth steam plants has been sorely taxed?

The Plant at the Mine in Pennsylvania —

England has, I believe, contemplated the building of some sixteen large generating stations, interconnected, for the supplying of electrical energy to the United Kingdom of Great Britain, and estimated the economic saving to be $600,000,000—with the cutting in two of the fuel requirements of industries now supplied with electric power. This is an incentive for the early construction of the pioneer plant-at-the-mine as is planned in Pennsylvania to supplement and supply the energy now delivered by the 427,000 kva. of generating machinery and 284 companies.

Consider, if you please, a certain group of utilities with 205,000 kva. now installed and with an approximate annual fuel tonnage of 274,096. Based on the 1915 average of .83 kw-hr. per pound of coal burned, the economy in freight charges alone at $2.20 per ton would be $603,011.00. This sum is exclusive of the saving possible by the elimination of the lost motion in rehandling the fuel at the terminal points. Again, consider that the 205,000 kva. installed supplies only two-thirds, based upon the statements of the Regional Director of the War Industries Board, of the total electrical energy required in Philadelphia, a city of 1,800,000 inhabitants. The

remaining one-third now generated with steam equipment delivers only 0.44 kw-hr. pound of coal burned. An additional economy of $142,498.00 in freight is apparent, were the energy to be transported in electrical form, or a total of $745,509.00—which may be used to cover interest and all fixed charges incident to the construction and maintenance of a 100 mile, 120,000 kva. double tower transmission line at an expense of $7,600,000.

Proportionate savings would obtain by the construction of two more tower lines—one of 105 miles to another large city, from which distributing center energy would be marketed by the Public Service Electric Company of New Jersey, and the other of 85 miles to McCalls Ferry—where the hydro-electric project now supplying energy to the city of Baltimore, Maryland, would be tied in with the reliable plant-at-the-mine. This means an additional investment of $6,790,000, or a total investment of $14,390,000 for transmission system only. This expense would be covered, from an investment standpoint, by the saving in fuel transportation charges of approximately $1,550,065, yielding in excess of 7%, after reasonable allowance has been made for maintenance and repairs.

This is of course a large outlay to contemplate at a reconstructive period in our history—but are the lessons learned in the late emergency to be forgotten so easily? Common sense demands that reconstruction at home be considered as of equal importance, if not more so, than elsewhere, and especially when a reasonable return on the investment for permanent improvements — in this case high tension transmission lines—is assured by the elimination of transportation charges alone.

AUSTRALASIAN UNDEVELOPED WATER POWER

The London Electrical Review in a recent survey of water powers in the United Kingdom estimates the available supply in Australasia.

Australasia.—With the exception of New Zealand, the water power resources of Australasia have never been systematically surveyed.

Estimates have been made of a few of the more promising hydraulic powers of Tasmania. The Agent-general (Sir John McCall) estimates the possibilities at about 400,000 h.p. The State Government proposes to utilize the water of the King River in the near future to supply some 40,000 h.p. to the mining districts in the West. So far only three hydraulic installations have been developed. These are the Great Lake scheme, at present developing over 12,000 h.p.; the South Esk scheme, developing 1,350 h.p.; and the Lake Margaret scheme of the Mt. Lyell Mining Company, developing 4,000 h.p. The Great Lake, with a head of 1,120 ft., is capable of developing 70,000 h.p. The plant is now being enlarged. Part of the power is to be used for zinc reduction and calcium carbide production.

In view of the shortage of water powers in Australia, and of the future demand of the Commonwealth for nitrogen products, etc., there should be no difficulty in finding a market for the output of all the energy which can be developed in Tasmania. Though comparable in area with the United States, there has yet been no notable hydroelectric development in Australia. The only possibilities of considerable powers are to be found in the rivers draining the Great Dividing Chain of the East Coast. Probably the possibilities of the Australian Alps lie between 300,000 and 500,000 h.p.

The Blue Mountains, to the west of Sydney, form an important high-level catchment; the available power is likely to be between 25,000 and 50,000 h.p.

The New England Range in New South Wales and Queensland has available power probably between 200,000 and 500,000 h.p. The State Government has outlined a power scheme for the river Clarence capable of producing 150,000 h.p.

In Queensland, Cairns District, the available horsepower probably lies between 150,000 and 400,000 h.p. The Barron River Falls would yield at least 10,000 h.p. This district is favored in respect of shipping facilities and is rich in copper, tin, and other minerals.

The aggregate power suggested as being capable of economic development in the Great Dividing Chain is from 625,000 to 1,300,000 h.p. In all cases the scheme would be somewhat expensive to develop, but in view of the general high cost of power in Australia, it would probably not be prohibitive.

New Guinea.—The physical characteristics of New Guinea offer exceptional facilities for developing water power. There are numerous rivers of large volume and steep gradient, and there is evidence that in the aggregate, the available power is enormous. German New Guinea, the territory occupied by the Australian forces during the present war, has also great prospects. Altogether the potential water power in the section of the island now under the British flag may amount to as much as 15,000,000 h.p.

The physical characteristics of New Zealand render the country particularly well adapted for providing large stores of water power, and for facilitating their development. The backbone of high mountains leads to heavy precipitation from the moist westerly winds, and the mountain ranges are studded with extensive lakes, situated above a deeply indented coast line, and support many glaciers of large size which act beneficially in equalizing the run-off throughout the year. A list of 72 important and promising schemes places the economically workable water powers of the Dominion at 3,700,000 b.h.p. on the turbine shafts. Of this, 500,000 h.p. is found in North Island and 3,200,000 in South Island. The power actually developed and in use in 1916 is given in the government returns as 42,600 b.h.p. Many other projects are, however, in course of construction or under consideration.

The outlook for New Zealand, at the dawn of what promises to be an era of unexpectedly great electrochemical and electrometallurgical activity, is most promising. As a center for the manufacture of nitrogen products, aluminum, calcium carbide and the like, its situation is ideal. The fundamental requirement, a great excess of energy over the power needs of the country, is provided.

THE NATIONAL ASPECT OF THE PUBLIC UTILITY

BY FRANKLIN T. GRIFFITH

(The question of higher street car fares is here discussed from the standpoint of what may legitimately be done to keep them low. It seems logical that the entire community should bear some of the burden, as it shares in the benefits, of transportation. What is being done by the companies themselves is further touched upon. The paper is one which was presented by the president of the Portland Railway, Light & Power Company at a luncheon of the Progressive Business Men's Club of Portland.—The Editor.)

During the last eighteen months fare increases of street railways have been granted in 274 cities of the United States. There are in the United States 158 cities having a population in excess of 40,000. Fare increases have been made in 90 of these cities and applications for increase are now pending in practically all of the remainder of them. A number of the larger cities in the country are now operating on a 7c fare. The largest cities in the state of New Jersey, including Newark and Jersey City, have a fare of 7c with 1c additional for transfer. In Pittsburgh a zone system has been established with a fare of 5c in the initial zone and 7c in the outer zone. A zone system with an initial fare of 6c and 2c per mile in addition thereto is operating in Milwaukee, Wis. Providence, Rhode Island, has a zone system based on 2c per mile. The elevated railways of Boston, Mass., are now being operated by a commission appointed by the state and a fare of 8c has been established since December first. More than two-thirds of the urban population of the United States is now paying 6c or more for street railway fares.

The necessity for increased rates of fare is due to two causes: first, the decreased purchasing power of money, and second, the improvement in working conditions of public service employes, coupled with increased wages. Throughout the country employes of public service companies are insisting that their working conditions and wages be placed on a comparable basis with the wages and working conditions of other industries and proper recognition of this demand has and will increase the cost of public service.

The situation of the public utilities is so serious that the National War Labor Board has in every case of granting increased wages called upon the regulating authorities to readjust fares so as to enable the company to pay the increased wages awarded.

The function of a street railway is to give adequate and convenient service at the lowest practicable cost consistent with reasonable wages and working conditions of the employes and with a reasonable return only upon the actual value of the property devoted to public service. A reasonable return upon the investment is to be determined by the rate at which money can be borrowed for public utility investment. Such rate is directly affected by the earning power of the utility. The more certain the utility is of maintaining a reasonable earning upon its investment the lower will be the rate at which it can borrow money necessary for its extensions. All public utilities are now strictly regulated by public service commissions with power to keep rates at such figures as will prevent unduly high earnings so that public service operation today has become a question of determining the actual cost of the service given under efficient management and fixing rates for the service sufficient to pay the cost thereof. It naturally follows that all things tending to reduce the cost of service will directly affect the rates to be charged therefor and it is, therefore, to the advantage of all users of public utilities to reduce to a minimum or entirely eliminate all public charges imposed upon the utilities. Where a utility is owned by a municipality no public charges are imposed upon it and if it is proper to relieve a municipally owned utility from the payment of taxes and other public charges for the purpose of keeping down the rates charged the patrons of the utility, it is equally proper to relieve a privately owned utility from such taxes and public charges because such elimination of expenses does not inure to the benefit of the owners of the property, but under public regulation inure directly to the benefit of the utility's patrons.

Practically every street railway in the country and the municipalities in which they operate are now considering the solution of the problem on the basis of cost of service and it is hoped that some definite principles and systems will be devised and established before the industry as a whole sinks into utter ruin, toward which it is now rapidly progressing.

The utilities themselves should, and I believe are endeavoring in every possible way to keep down the cost of service by introduction of economies without impairment of service. One of the methods now being considered and in some instances adopted, is the use of the light weight safety car. This is a steel car having a seating capacity of 32 and operated by one man. It has been introduced in a number of cities on those lines of street railway not subjected to extraordinary congestion and is producing satisfactory results. The Emergency Fleet Corporation has purchased for and sold to the Portland company 25 such cars on term payments. These cars will reach Portland during the next few weeks and it is believed that their use on some of the lines will not only improve service, but also to some extent reduce costs. It is not deemed practicable to substitute the safety cars for more than a comparatively small proportion of the heavier cars now in use in any large city, but that they can be used to advantage on some of the lines of street railway in every city the authorities are fairly well agreed.

In Portland the wage increase of street railway employes exceeds $1,000,000 per year over the wages paid in 1916 and the increase in operating expenses of the company as a whole is approximately $2,000,000 per annum greater than it was two years ago. More than 80% of this increase in operating expenses is represented by increased wages.

SAVING THE WASTE IN THE CHIMNEY---III

BY ROBERT SIBLEY AND CHAS H. DELANY

(The determination of the actual draft required with the particular fuel in use in a given plant is a primary consideration in determining the height and regulation of the chimney. The very practical consideration of how to ascertain this element is here taken up in the third of a series of articles on chimney savings. To ascertain the draft required when oil is used as a fuel will be discussed in a later article.—The Editor.)

ACTUAL DRAFT REQUIRED FOR DIFFERENT FUELS

For every kind of fuel and rate of combustion there is a certain draft with which the best general results are obtained. A comparatively light draft is best with fire burning bituminous coals and the amount to use increases as the percentage of volatile matter diminishes and the fixed carbon increases, being highest for the small sizes of anthracites. Numerous other factors such as the thickness of fires, the percentage of ash and the air spaces in the grates bear directly on this question of the draft best suited to a given combustion rate. The effect of these factors can only be found by experiment. The following curves compiled by the Babcock and Wilcox Company are plotted from the records of numerous tests and allow a safe margin for economically burning coals of the kinds noted.

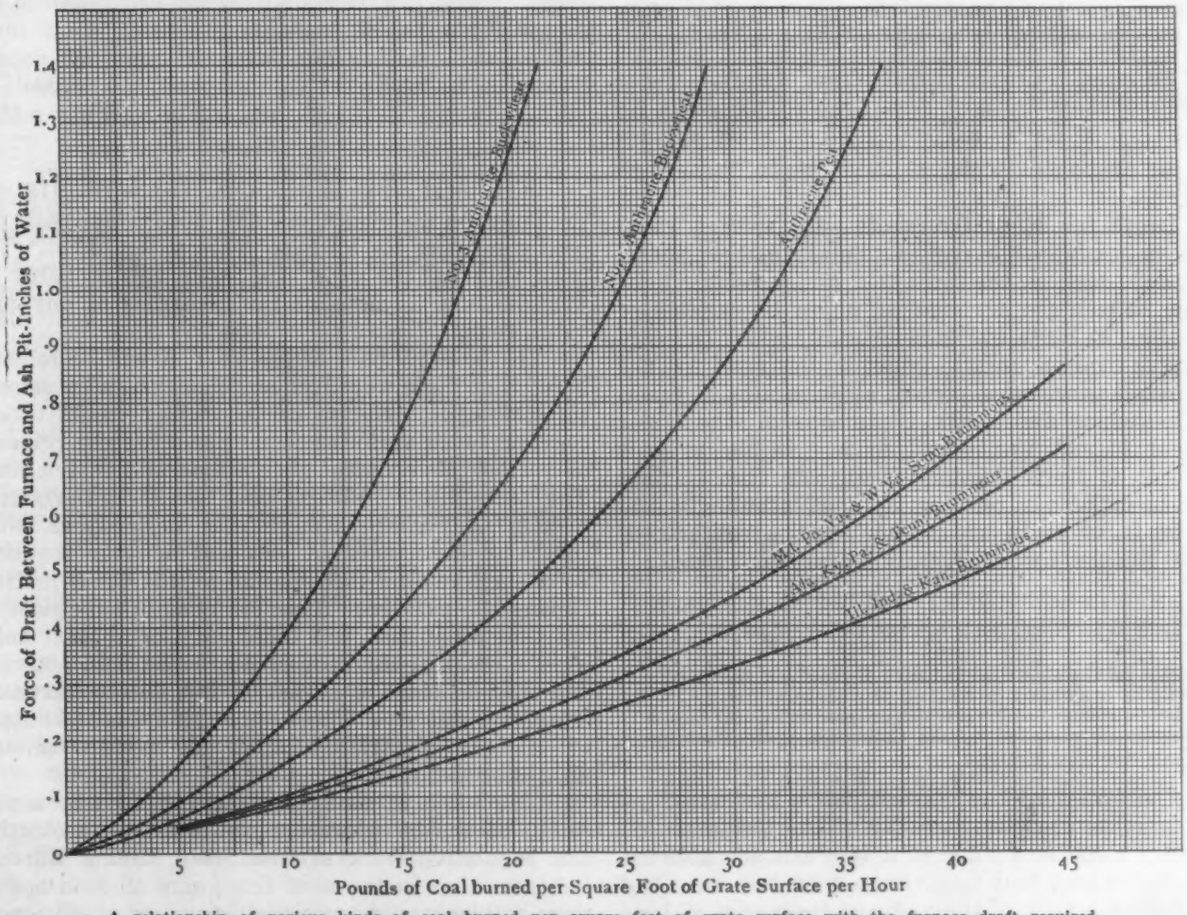
Boiler grates are usually proportioned so that the grate surface bears to the heating surface of the boiler a proportion suitable to the kind of fuel to be burned and the draft available. Thus if the boiler is to be fired by a good grade of bituminous coal, and is to be provided with ample draft, the ratio of grate surface to heat surface may be 1 : 65 or 1 : 70. If anthracite coal is to be used, or if the draft available is low, the grate surface must be increased and the ratio of grate surface to heating surface may be as low as 1 : 40 or in extreme cases 1 : 30. For average conditions, in which the boiler builder is not familiar with the fuel and draft conditions, it may be assumed that the ratio of grate surface to heating surface will be 1 : 50. The heating surface is designed according to the Builders' Rating which is that 10 sq. ft. of heating surface must be allowed for each boiler horsepower to be developed.

Thus we find that an average boiler installation of 2000 boiler horsepower has the following design:

$$\text{Heating surface} = 10 \times 2000 = 20000 \text{ sq. ft.}$$

$$\text{Grate surface} = \frac{20000}{50} = 400 \text{ sq. ft.}$$

Pounds of Coal.—A fuel is rated as to its ability to evaporate a given quantity of water from and at



A relationship of various kinds of coal burned per square foot of grate surface with the furnace draft required. This chart is from "Steam," published by Babcock & Wilcox Boiler Company.

212°F. per lb. of fuel burned. Since a boiler horsepower is equivalent to the evaporation of 34½ lb. of water from and at 212°F. per hour, we may compute the lb. of fuel required per hour thus:

$$\text{Total coal burned per hr.} = \frac{\text{Bl. hp.} \times 34\frac{1}{2}}{M} \quad \ldots\ldots\ldots (1)$$

in which M = lb. of water evaporated from and at 212° F. per lb. of fuel burned.

Thus Alabama bituminous coal evaporizes 8 lb. of water from and at 212°F. per lb. of fuel, therefore the fuel required per hour for a 2000 Bl. hp. installation is—

$$\text{fuel required} = \frac{2000 \times 34\frac{1}{2}}{8} = 8624 \text{ lb. per hr.}$$

Pounds of Fuel per sq. ft. of Grate Surface.—The pounds of fuel per sq. ft. of grate surface is now directly obtained by dividing the total fuel required per hr. by the grate area.

Thus if a 2000 h.p. boiler installation requires 8624 lb. of bituminous coal per hr. and its grate area is 400 sq. ft. the pounds of fuel per sq. ft. of grate

$$\text{surface} = \frac{8624}{400} = 22 \text{ lb.}$$

To Compute the Fuel Required for Overload Conditions.—An overload condition of 50% is usually allowed in computing draft for chimney design. For a 50% overload, it is found in practice that an additional 60% of fuel is necessary. Hence a boiler requiring 22 lb. of fuel per sq. ft. of grate surface per hr. will require 35 lb. for overload conditions.

To Read Furnace Draft from Chart.—Hence from the chart we now read the furnace draft required which for 35 lb. per sq. ft. of grate surface per hr. for bituminous coal is found to be .5 in. of draft.

Draft for High Overloads.—In special cases where a heavy load is required during a short period each day, such as the peak load of an electric light plant, boilers are designed so as to be capable of operating at 100% overload or even higher. In every case the draft apparatus must be designed for the maximum overload expected, as it is always possible to reduce the draft by means of the boiler damper to suit the lighter loads. In the present example, if 100% overload is expected the furnace must be capable of burning 50 lb. of bituminous coal per sq. ft. of grate surface per hour, which according to the chart would require a draft of .9 inch.

FUEL OIL PRODUCTION IN CALIFORNIA

(Men of the electrical industry throughout the West will be interested in reading this terse summary of the petroleum and natural gas production in California, as compiled by the California State Mining Bureau.—The Editor.)

The fact that the general public has not thoroughly recognized the stability of the California oil industry is no doubt due to a very considerable extent, to the fact that many large operators have had too limited a view of the value of their own oil land assets. Men who have been successful in finding new oil fields frequently do not concern themselves with the later details of development. The idea has been too prevalent that profits must be quickly seized, regardless of the ultimate value of the property, and in many instances properties have been injured by careless operations. Some of the largest oil producers in the state have operated along such lines. This condition is clearly and definitely brought out by facts collected by the engineering staff of the State Mining Bureau during the past year in the testing of water shut-off at new wells. The average efficiency of the small concerns in this very important operation was 91 per cent while that of the large concerns was only 80 per cent. In fact, only one large scale operator, the Shell Company of California, showed results equaling or excelling the average figure for the small companies; and one of the very largest producers, the Standard Oil Company, actually showed an efficiency of only 71 per cent.

A comparison of the present ownership of proved oil lands with that of four years ago, still shows that there is no monopoly, although 65 per cent of the lands are held by only nine companies, and 72 per cent of the oil is produced by them. The land ownership and percentage of the total oil production by the larger concerns is shown in the following tabulation:

Operator.	% of total oil	Proved Land acres	Number wells
Associated Oil Company	9.1	7347	1048
Doheny (various companies)	7.3	4286	379
General Petroleum Corporation	4.3	2584	400
Honolulu Consolidated Oil Co.	1.3	2701	35
Atchison, Topeka & Santa Fe Ry. (oil subsidiaries)	4.0	3097	412
Shell Company of California	6.8	2442	236
Southern Pacific Co. (Fuel Oil Dept.)	8.5	18267	681
Standard Oil Company	22.6	8187	771
Union Oil Company of California	8.1	8198	427
All others	28.0	30171	3381
Total	100.0	87280	7770

The total oil production for the year 1918 will probably be about 100,000,000 bbl., which will exceed the figure for all past years except 1914. The total value of the oil at the wells will probably be $123,000,000, an amount far in excess of any previous year.

In the early part of the year, it will be remembered that there were frequent panicky and pessimistic statements relative to decreasing stocks of oil, together with various special pleas for the removal of various government regulations and restrictions. The State Mining Bureau each week regularly furnishes the public, through the newspapers, with complete statements of oil field activity together with such general information as the facts justify. During the past year these statements have pointed out that production was increasing, or at least holding its own, in the fact of decreased field activity, and that decrease of stored oil was due to increased industrial activity. There is not an unlimited supply of oil, and industrial demands for power can not always be met with oil.

The spirit of cooperation, manifested by a majority of the oil operators, towards the protective and regulative work of the State Mining Bureau, indicates that in the next few years oil field operations will be brought to a high standard of efficiency.

SPARKS—Current Facts, Figures and Fancy

(An electrical fish stop which is being used in the Northwest to prevent fish from going up the wrong streams, an electrical means for extracting salt from the ocean which is being used in Norway, and an invention which claims to have greatly lengthened the life of the incandescent lamp are among the interesting items here recorded.—The Editor.)

The statute of "Electricity" on the top of the Telephone Building at 195 Broadway, New York City, is twenty-four feet high and weighs sixteen tons. It is 434 feet above the street level.

* * *

The bray has been taken out of the army mule, according to a contemporary, by a simple operation on its tail. It seems that if a mule cannot raise its tail it cannot bray, and so by simply cutting the muscles which perform the operation, the beast is silenced.

* * *

Electrical fish stops have recently been invented by an Oklahoma man, which are said to prevent fish from following wrong streams. The invention was demonstrated by the United States Bureau of Fisheries in the Northwest recently and was declared a success.

* * *

An electrical trap for tramps is said to be in use by the Southern Pacific Company. It is simply an ordinary box-car with an electrical device to indicate when hoboes enter, and an arrangement by which the door is closed and locked. The electric indicator is a "burglar mat," operated by a battery under the floor of the car.

* * *

The latest convenience for traffic policemen is to be found in Columbus, Ohio, where large red and white umbrellas labeled Stop and Go on their opposite faces are used, not only to direct traffic but to give shade for the policeman on a hot day. The policeman revolves the umbrella by means of a small handle, as in the ordinary semaphore.

* * *

According to an English paper, a telephone subscriber in Newark, England, asked his operator to ring his bell in three minutes, and immediately hung up his receiver. At the appointed time the supervisor rang on the line, and the subscriber responded merely with "Thank you." Later he called again to thank the operator, and explained that he had been boiling eggs and wanted to time them.

* * *

A substitute for radium for use on the dials of instruments on airplanes so that these instruments can be read at night, and for electric push buttons, has been made accessible by the Bureau of Mines in the mineral mesothorium which is extracted from monzanite sand, found in the Southwest. It is now largely made out of the waste products in the process of gas mantle manufacture and of thorium salts. The successful methods of recovery worked out therefore represent an important mineral saving.

* * *

While iron is the only metal that can be made into a really powerful magnet, the property is not peculiar to iron. It has been discovered recently that silver can also be magnetized under certain circumstances. Some bars of exceptionally pure silver were heated to 130 deg. C. and left for some time in a strong magnetic field, in connection with some experiments on gravitational attraction, according to the London Electrical World. It was afterwards found that the silver had become weakly, but permanently, magnetized by this treatment.

* * *

A new multi-filament for an incandescent lamp has been devised by a Los Angeles inventor which is said to provide 12 filaments each of 25 candle power. Four are lighted when the lamp is turned on, and the next four are automatically brought into circuit whenever a filament fails. In this way the life of a lamp is considerably prolonged. Thus, if the average life of a filament is assumed to be 1,000 hours, the lamp would still be giving 100 candle-power after 2,000 hours, and can be used with diminished candle-power until the last filament gives way.

* * *

Experiments in Norway with a view to extracting salt from ocean water by means of electricity have been successful and two salt factories are to be started for this purpose in the near future. One is to be in the western and the other in northern Norway, as these districts, on account of the fisheries, are the best home markets. Besides the salt, different by-products will be made. During the war it has been difficult to get salt from abroad and sometimes it has been impossible to salt down the fish. The new salt works should greatly improve the situation.

* * *

An invention which has taken the "static" out of wireless telegraphy, removing thereby the greatest obstacle to the clear transmission of radio messages, is said to have been perfected by the chief engineer of the Marconi Wireless Telegraph Company. The invention not only makes possible the sending of clear radio messages regardless of atmospheric conditions, but also does away with the necessity of constructing huge wireless towers. Perfect service, it is reported, can be obtained with the use of antennae extending only a few feet from the ground.

PERSONALS

James C. Clark, assistant professor of electrical engineering at Stanford University, is filling with unusual credit the chairmanship of the San Francisco Section of the American Institute of Electrical Engineers. The section has immediately ahead some meetings of great current interest. On January 24, 1919, will be held a joint meeting of local sections of five national engineering societies, over which Professor Clark will preside, as the meeting is to be held under the auspices of the Institute. The subject for the evening will be a symposium on reconstruction problems which will deal with matters of intense interest to the engineering profession as a whole and will be treated by men of national engineering reputation. On February 7, 1919, the meeting of the local section will deal with unification of telephone systems at which time Daniel E. Wiseman, equipment engineer for the Pacific Telephone & Telegraph Company, who has so ably solved this problem in Los Angeles which proved vexing for so many years, will deliver a paper setting forth the method of solution in Los Angeles. In addition to these interesting meetings, a weekly informal luncheon of the Institute membership is held at the San Francisco Engineers' Club on each Friday. Summing up the situation as a whole, the Institute activities in and about the San Francisco bay region are in an unusually healthy condition.

W. G. Vincent, valuation engineer for the Pacific Gas & Electric Company, is recovering from a severe attack of the Spanish influenza.

E. O. Shreve, San Francisco manager of the General Electric Company, has recovered from a severe attack of the Spanish influenza.

Barry Dibble, project manager of the Minadoka Project of the U. S. Reclamation Service with headquarters at Rupert, Idaho, is a recent San Francisco visitor.

Ralph A. Gibson is now Chief Engineer of Plant of the G. E. Standifer Construction Corporation, shipbuilding company across the river at Vancouver, Washington.

C. R. Hunt, San Francisco manager of Robbins & Myers Company of Springfield, Ohio, has returned to San Francisco after a business trip to the East covering several weeks.

C. H. Purcell, formerly Bridge Engineer with the State Highway Commission, is Senior Highway Bridge Engineer, Federal Office of Roads, with headquarters at Portland.

A. A. Miller, manager railway and power divisions of the Seattle office of the Westinghouse Electric & Manufacturing Company, visited Portland and Spokane in December.

Samuel Kahn, general manager of the Western States Gas & Electric Company and president of the Pacific Coast Section, N. E. L. A., has been confined to his home with a severe attack of influenza.

R. F. Behan, assistant to the San Francisco manager of the Westinghouse Electric & Manufacturing Company, has severed his connection with the company. Mr. Behan's new business connections are as yet unnannounced.

E. B. Strong, president of the Technical Publishing Company, publishers of the Journal of Electricity, is in the East where he will remain for some months, visiting practically all of the large eastern industrial centers in the interest of the Journal of Electricity.

S. P. Russell has resigned as manager of the electrical department of H. W. Johns-Manville Company at San Francisco and has purchased an interest in the firm of H. B. Squires Company, Manufacturers' Agent at San Francisco, with which concern he is now associated.

F. A. Gerhart will in future represent the Crouse-Hinds Company on the Pacific Coast with headquarters in San Francisco. Mr. Gerhart succeeds Geo. A. Gray who resigned his position with the Crouse-Hinds Company in order to establish a manufacturers' agency on the Pacific Coast.

Geo. A. Gray has resigned as sales engineer on the Pacific Coast for Crouse-Hinds Company, after nine years' service. He has opened offices as "business builder" for manufacturers in the Sheldon Building, San Francisco, and is open for engagement as sales representative of several electrical manufacturers.

E. O. Edgerton has been reelected as president of the California Railroad Commission. The commission is now composed of five members, as follows: E. O. Edgerton, Harley W. Brundidge, Irving J. Martin, F. R. Devlin and H. D. Loveland.

Franklin T. Griffith, president of the Portland Railway Light & Power Company, has been elected president of the Arlington Club of Portland, Oregon, and with the determination to be led by an electrical man in any case, **Guy W. Talbot**, president of the Pacific Power & Light Company, was chosen to hold the position of first vice-president.

R. Boan, engineer of tests, **E. W. Arthur**, assistant manager, and **F. J. Shea** of the mechanical branch of the Victoria Government Railways of Melbourne, Australia, have returned to their home city after spending several months in this country and in Canada, investigating railway conditions and other matters of interest pertaining to the electrical industry.

C. E. Grunsky, a consulting engineer of San Francisco and well known to readers of the Journal of Electricity as the author of a valuable and helpful series of articles on rate fixing published in its columns during recent months, has been elected a director of the American Society of Civil Engineers and is now in New York, attending the annual meeting of the society.

E. A. Rogers, formerly with the steam power department of the Pacific Gas & Electric Company and later efficiency engineer for the Palace Hotel Company, has left San Francisco to become chief engineer of steam power generation for the Cornelia Copper Company with headquarters at Ajo, Arizona. This splendid new power plant, erected by Chas. C. Moore & Company, is said to possess one of the most remarkable efficiencies ever produced under fuel oil operation.

M. C. M. Hatch, a well-known mechanical engineer of New York City who is with the Locomotive Pulverized Fuel Company, has been spending several weeks at various Pacific Coast centers. Mr. Hatch, as a member of the American Society of Mechanical Engineers, has presented a number of helpful papers before various sections of the Society on the subject of pulverized fuel, of which subject he has been a close student for several years. The need for fuel substitutes in the West has made the subject of powdered coal and the possible use of lignite deposits throughout the West of unusual interest.

Chas. Frank Stern, formerly a member of the California State Highway Commission, where he rendered excellent service to the state in aiding the construction of California's justly renowned system of highways, has been appointed State Superintendent of Banks. While the attractive salary attached to the new position, consisting of ten thousand dollars per annum, is sufficient in itself to give the new appointee much publicity throughout the West, the Journal of Electricity views the advent of Mr. Stern into banking circles of the West from an entirely different light. Mr. Stern comes to the new office in the prime of a young manhood that speaks with such eloquence to all his audiences that it is confidently believed the financial status of this commonwealth will be forwarded under his direction and a stronger footing for public utility growth established, since the financing of our western securities is so closely interwoven with the stability of our banking institutions.

C. H. Delany, steam power plant specialist of the Pacific Gas & Electric Company, San Francisco, and joint author of a recent book on "Elements of Fuel Oil and Steam Engineering," is spending a week in Seattle, to investigate the use of powdered fuel in that vicinity.

C. W. Koiner, general manager and electrical engineer of Pasadena's Light and Power Works, has returned to his regular duties at Pasadena, California, after serving for a period in war work, having served with the engineering section, power department, of the United States Shipping Board, Emergency Fleet Corporation, looking after technical work and general power problems.

J. A. Wells of the service department, Westinghouse Electric & Manufacturing Company, East Pittsburgh, has established headquarters at Ellensburg, Washington, while engaged as inspecting engineer for that part of the equipment being furnished by the company to the Chicago, Milwaukee & St. Paul Railway for the Cascade electrification. Mr. Wells recently arrived and will be on the job for some months.

C. F. Vanbergen, engineer for the Holland Concrete Company at Java, Holland, is in Portland on a study tour which he is making of engineering works throughout this country. Mr. Vanbergen has been in America but a week and a half and expects to spend about three months visiting the big construction projects. Mr. Vanbergen's company is building a number of harbors in India and he is especially interested in that phase of engineering work.

H. N. Sessions, the able and efficient engineer for the Southern California Edison Company, although swamped with duties of office and calls upon his time for various national drives, in addition to sickness in his home, still has found time to gather together data regarding the remarkable work done by his company in salvaging the waste material and the consequent effect upon the company organization in such a campaign of thrift. This interesting and helpful data will appear in the Journal of Electricity, February 1, 1919.

Captain F. E. Pernot, now on special research with the Bureau of Standards at Washington, who formerly was assistant professor of electrical engineering at the University of California, is about to publish a book entitled "Logarithms of Hyperbolic Functions to Twelve Significant Figures." The book will be under joint authorship with Dr. B. M. Woods, assistant professor of mathematics at the University of California. The authors are now finally checking their calculations which are already in print at the University of California Press in Berkeley. The book should prove unusually helpful for long distance transmission computations.

J. B. Black, salesmanager for the Great Western Power Company with headquarters in San Francisco, in company with Messrs. Woodward and Heroux, manager and superintendent of the East Bay division of the company, has made a recent interesting inspection of the new industrial activities near Martinez, California. Men of the industry will be surprised and greatly pleased to note the vast new industrial activity of this growing district. Among the plants visited were: Shell Company, Butters Zinc Reduction Works, Cowell Cement, Port Costa Water, Pacific Coast Shipyards, C. A. Smith Lumber Mills, Pacific Electric Metals, F. E. Booth Packing Houses, Lanteri Shipyards, Pittsburg Chemical Works, Bowers Rubber Plant, Great Western Chemical, Port Costa Brick, and returning via Brentwood, where the trio were received by the management of the East Contra Costa Irrigation Company.

James M. Wadsworth, who did such effective work as administrative engineer of the Federal Fuel Administration for California, has left for Bartlesville, Oklahoma, to become assistant chief engineer of the Empire Gas & Fuel Company. While Mr. Wadsworth thus leaves active governmental work he still retains his title as consulting engineer for the Petroleum Department of the Bureau of Mines. Two departments of the Federal Fuel Administration ceased operations at the first of the year. They are the bureau of the administrative engineer, J. M. Wadsworth, and the Conservation Bureau, presided over by Walter Samson. The price fixing program of the Fuel Administration will continue for the time being, but at the signing of peace the entire Fuel Administration will withdraw. The oil division of the Federal Fuel Administration for the Pacific Coast is closing its offices. D. M. Folsom, chief of the division, will not present his resignation for some time, however, while there is need for his services with the Petroleum War Service Committee, which is in charge of tankers on the Pacific Coast.

OBITUARY

Jacob Bard, chief engineer of the Sangamo Electric Company and one of the leading electrical meter engineers of the country, died on December 13th, 1918, at his home in Springfield, Illinois, from pneumonia. Graduating from the University of Illinois in 1906 and after a few years' work divided between the Western Electric Company and the Peoria Gas & Electric Company, Mr. Bard entered the employ of the Sangamo Company in 1911, rapidly rising to have charge of all engineering matters, including development work for that company. Mr. Bard was a member of the American Institute of Electrical Engineers. He leaves a widow and one son.

Alfred Statley, manager of the local telephone exchange at Independence, Ore., died recently from pneumonia following influenza. Mr. Statley had been manager for two years. He was formerly in the employ of the Home Telephone Company in Portland. He is survived by his wife, who lives at Independence, and other relatives in St. Louis, Mo.

Douglas W. Taylor, for fourteen years at intervals city engineer of Portland, Ore., died recently from pneumonia, following influenza. At one time Mr. Taylor was surveyor-general for Oregon and in 1891 served as city superintendent of streets.

MEETING NOTICES FOR ELECTRICAL MEN

(The New Year has been marked in many of the western electrical organizations by the election of officers, the results of which are given below. Particular activity is reported from the Northwest where an irrigation and drainage congress has taken up matters of land settlement and irrigation legislation.—The Editor.)

San Francisco Electrical Contractors and Dealers

Thirty members and guests of the Electrical Contractors and Dealers' Association assembled for an "old year's" luncheon at a local cafe on December 28th. The first and only order of business was the election of officers for the ensuing year, as follows:

President, C. L. Chamblin
Vice-President, W. D. Kohlwey
Secretary, J. Stewart
Treasurer, Frank Watts
Executive Committee: H. C. Reid, C. B. Kenny, J. Hetty
Conference Committee: C. F. Butte, T. J. Bennett, J. M. Carlson.

Therafter a free expression of ideas was given by the members, several representatives of the inspection departments and the electrical press. The meeting did not adjourn till late in the afternoon and all present agreed that it was the pleasantest of these annual affairs yet held.

Local Sections A. I. E. E. and N. E. L. A., Portland, Oregon

A regular meeting of the Portland local sections of the A. I. E. E. and N. E. L. A. was held at 8 p.m. at the Multnomah Hotel, Portland, Oregon, Jan. 7th, 1919. Prof. W. C. Morgan of Reed College was the speaker of the evening, his subject being "The Chemistry of the War." The talk was followed by an informal dance and buffet lunch for the members and their ladies.

Northwest Society of Highway Engineers

This association held its annual meeting and election of officers Jan 11, 1919, at 6 p.m. at the Portland Hotel, Portland, Oregon. The regular meeting was preceded by a business meeting at 4 p.m. and a banquet, after which Prof. Warren D. Smith of the University of Oregon read a paper on the "Importance of Geology to the Engineer."

M. O. Bennett of Pendleton, Oregon, and H. E. Abry of St. Helens, Oregon, led the discussion on the prepared legislative bills to be brought before the Oregon Legislature this spring. Two of the most important bills to be presented are the bills requiring professional engineers to be licensed and to abolish the position of road masters and provide for the appointment of county engineers. A fine musical program rendered during the banquet formed a pleasant feature of the gathering.

The former officers of the association are: Herbert Nunn, president, O. Laurengard, director, and G. R. McCleod, acting secretary, Salem, Oregon.

Spokane Engineers

The Spokane chapter of the American Society of Civil Engineers, at a luncheon given at the University Club in that city on December 13th, elected the following officers: President, H. G. Doolittle; vice-presidents, C. A. Burnette and E. G. Tabor; secretary-treasurer, Charles Davis. Captain T. H. Judd, of Pullman, five years ago associated with President Doolittle in the state highway department, was a guest at the luncheon. He recently returned from overseas and wears a wound stripe and another for six months' service overseas.

Annual Meeting of Seattle Engineers' Club

The annual election of the Engineers' Club, Seattle, was held on January 10th, the polls closing at 12 o'clock noon. The following officers have been chosen: President, H. E. Horrocks; vice-president, L. M. Grant; secretary, E. J. Bartells; treasurer, Amos Statler; executive board, J. E. Pinson, Stuart Mannell and R. S. Drury. The annual meeting of the club was held Saturday night, Jan. 11th, in the club rooms, and reports from the entertainment committee indicate a large attendance.

Irrigation Institute Convention

The Washington Irrigation Institute held its sixth annual convention at Yakima on December 17 and 18, 1918. President Elbert M. Chandler in his annual address carefully outlined the work of the institute, emphasizing the increasing importance of irrigation.

The institute endorsed the land settlement plan outlined by Secretary of the Interior Franklin K. Lane to obtain homes for returned soldiers and bring about a healthy rural community life.

An important resolution recommended to the legislature is the passage of an act amending the present irrigation code to provide that no indebtedness shall be incurred by any irrigation district within the state until the plan of irrigation proposed by said irrigation district shall have been approved by the state hydraulic engineer and a permit issued by him therefor. The chairman of the proposed state land settlement board, the state engineer and state commissioner of agriculture shall constitute a board to be known as the irrigation district, until the project shall have been approved by the state hydraulic engineer and the securities secured thereby are approved by the said commission. It was also recommended that the irrigation district bonds be added to the class of securities in which the permanent school fund may be invested after being passed upon by the irrigation district board commissioners.

The institute adopted resolutions indorsing 12 proposed

BUILDERS OF THE WEST—XLV

C. D. MARX

To have been professor of civil engineering for many years in a great university, to have been president of the American Society of Civil Engineers, and lately to have risen to the acting presidency of Stanford University are indeed outward indications of the technical worth of an engineer as a builder of the West. But to that large group of engineers who have been touched by his gentle, helpful presence, the real qualities of the builder are best shown in the affectionate title by which he is known to those who have learned to appreciate the helpful presence of "Daddy" Marx. And so to "Daddy" Marx, as a Builder of the West, this issue of the Journal of Electricity is affectionately dedicated as a lasting memorial to his method of instilling hope, courage, and constructive imagination in the hearts of countless engineers of the West.

amendments to the proposed irrigation district law, as follows:

1—That provision be made for the combination of irrigation districts.

2—That provision be made for a larger number of directors in large districts.

3—That provision be made for the handling of all drainage matter in all irrigation districts by the board of directors, and for incorporating in irrigation districts now organized all drainage districts within the boundaries of such irrigation districts.

4—That provision be made for the acquisition of rights of way for districts similar to that now used by drainage districts.

5—That irrigation districts be allowed to provide for the delivery of domestic water in separate supply, and for the development of hydroelectric energy in connection with the irrigation district, the lease or sale thereof for corporate use, either private or public.

6—That the board of directors of irrigation districts be authorized to employ irrigation specialists.

7—That some provision be made for the change of due dates in bonds, subject to a vote of the water users of any district, maturing the same in less than twenty years where desired.

8—That amendment to the present method of levying assessments be made in order that the time be extended for the preparation of the assessment roll and providing for a rate of assessment prior to the hearing by the board of directors for the correction of said assessment roll.

9—Amendment to the district law in order to avoid unnecessary cost of publication of delinquency lists.

10—To provide for proper working funds within the district to avoid delays and inconveniences in the employment of labor now imposed by the system of payment by warrant through the county treasurer's office.

11—Amendment of local improvement district act to provide for the enlargement of existing local improvement districts, to provide for a longer time of payment, 15 or more years being allowed where the cost per acre warrants it.

12—To provide for delinquent tracts paying costs of collecting from such tracts.

After the adoption of the resolutions many of the members enjoyed a formal banquet at the Commercial Hotel, at which Col. Howard A. Hanson of Seattle acted as toastmaster owing to the illness of Duncan Dunn of Wapato, who was to have acted in that capacity.

President Chandler appointed a new standing committee on legislation composed of Ralph Williamson, Yakima; George T. Crane, Brewster; H. E. McGregor, Prosser; Judge Ralph Kauffman, Ellensburg; Prof. O. L. Waller, Pullman; R. K. Tiffany, Yakima; E. F. Benson, Olympia, and H. M. Gilbert, Yakima.

WHERE THE MEN OF THE INDUSTRY MEET

(The place where you can find where and when the other man meets. Information as to changes in officers, or additions or corrections, should be addressed to the Service Editor, Journal of Electricity. It is hoped to keep this directory up to date, so that travelers in a strange town who wish to attend the meetings of allied groups may not be misdirected.—The Editor.)

A. I. E. E.—WESTERN SECTIONS

National Officers
President—Comfort A. Adams, Harvard University.
Secretary—F. L. Hutchinson, Engineering Socity Bldg., New York City.
Meetings—Monthly.

Los Angeles Section
Chairman—J. H. Cunningham, Southern California Edison Co., Los Angeles.
Secretary—Clem A. Copeland, Bureau of Power and Light, Los Angeles.
Meetings—Second Tuesday of each month.

Portland Section
Chairman—R. M. Boykin, care North Coast Power Co., 441 Pittock Block, Portland, Ore.
Secretary—W. D. Scott, Pacific Telephone & Telegraph Co., Portland, Ore.
Meetings—Monthly.

Denver Section
Chairman—Fred J. Rankin, Colorado Pub. Utilities Com., Denver.
Secretary—Robt. B. Bonney, 603 Wyoming Bldg., Denver, Colo.
Meetings—Third Saturday of each month, from October to May, at the Denver Athletic Club. Dinner at 6:15 p.m., followed by regular meeting.

San Francisco Section
Chairman—J. C. Clark, Stanford University, Cal.
Secretary—Allen G. Jones, Rialto Bldg., San Francisco.
Meetings—Fourth Friday each month—Engineers' Club, 7 p.m.

Seattle Section
Chairman—John Harisberger, 4015—4th Ave. N. E., Seattle, Wash.
Secretary—Glen Dunbar, City Lighting Department, Seattle, Wash.
Meetings—Monthly on third Tuesday in Chamber of Commerce Assembly Room, 9th floor, Arctic Bldg.

Spokane Section
Chairman—George Nixon, Main and Lincoln Sts., Spokane.
Secretary—G. H. Hoppin, 1128 W. Kiernan Ave., Spokane.
Meetings—Third Friday of each month.

Utah Section
Chairman—A. S. Peters, Mountain States Telephone & Telegraph Co., Salt Lake City, Utah.
Secretary—H. T. Plumb, 133 U St., Salt Lake City, Utah.
Meetings—Third Wednesday of alternate months, 8 o'clock. Assembly Room of Commercial Club, Salt Lake City.

Vancouver Section
Chairman—R. F. Hayward, Western Canada Power Co., Ltd., Vancouver, B. C.
Secretary—T. H. Crosby, Canadian Westinghouse Co., Vancouver, B. C.

A. I. E. E.—WESTERN BRANCHES

University of California Branch
Chairman—A. J. Swank, University of California, Berkeley, Cal.
Secretary—G. F. Teale, University of California, Berkeley, Cal.

University of Colorado Branch
Chairman—Albert S. Anderson, Boulder.
Secretary—Terril C. Smith, University of Colorado, Boulder.
Meetings—First and third Thursdays of each month of the school year in the Engineering Building, University Campus.

Idaho University Branch
Chairman—V. Pearson, Moscow, Idaho.
Secretary—L. J. Corbett, University of Idaho, Moscow, Idaho.
Meetings—First Wednesday evening of each month from October to June.

Oregon Agricultural College Branch
Chairman—J. A. Hooper, Oregon Agr. College, Corvallis, Ore.
Secretary—L. Happold, Oregon Agr. College, Corvallis, Ore.

Stanford University Branch
Chairman—C. H. Suydam, Stanford University.
Secretary—Frank Miller, Stanford University.

Montana State College Branch
Chairman—Roy C. Hagen, Montana State College, Bozeman, Mont.
Secretary—J. A. Thaler, Montana State College, Bozeman, Mont.
Meetings—Third Friday of every month of the school year in the Electrical Bldg.

Colorado State Agricultural College
Chairman—R. C. Richards.
Secretary—W. A. Stallings, Colorado State Agricultural College, Fort Collins, Colo.

Throop College of Technology Branch
Chairman—J. Paul Youtz, Throop Dormitory, Pasadena, Cal.
Secretary—Clark E. Baker, Throop Dormitory, Pasadena, Cal.

State College of Washington Branch
Chairman—Clarence E. Guse, Pullman.
Secretary—Ralph C. Guse, State College of Washington, Pullman.
Meetings—Bimonthly at Mechanics Art Bldg., Pullman, Wash.

CONTRACTOR-DEALER ASSOCIATIONS

National Association of Electrical Contractors and Dealers
Chairman—W. Creighton Peet.
Secretary—Harry C. Brown, 110 West 4th St., New York.
Executive Committeemen-at-Large—W. D. Kohlwey, California; Executive Committeeman—S. C. Jaggar, Portland.

British Columbia Ass'n Electrical Contractors and Dealers
President—E. Brettell, Vaucouver, B. C.
Secretary—Capt. W. J. Conway, Vancouver, B. C.
Meetings—First Tuesday of each month.

California Ass'n of Electrical Contractors and Dealers
President—M. A. De Lew, 180 Jessie St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Monthly.

Electrical Contractors and Dealers Ass'n of San Francisco
President—C. L. Chamblin, 641 Mission St., San Francisco.
Secretary—J. Stewart, San Francisco.
Meetings—Monday, 12:15; Jules Sutter Cafe.

Southern California Electrical Contractors and Dealers
President—G. E. Arbogast, 724 So. Olive St., Los Angeles, Cal.
Secretary—J. E. Wilson, 425 Consolidated Realty Bldg., Los Angeles, Cal.
Meetings—Every Friday at 6:30 p.m. at the Pin Ton Cafe, 427 South Broadway.

Monterey Bay Electrical Contractors and Dealers
President—W. Cox, Santa Cruz.
Secretary—J. A. Noggle, Monterey.

Nevada Ass'n of Electrical Contractors and Dealers
President—F. V. McAvoy, 138 N. Canter St., Reno.
Secretary—R. W. Shearer, 215 Sierra St., Reno.
Meetings—Twice a month, 15th and 30th.

Oregon Ass'n of Electrical Contractors and Dealers
President—R. C. Kenney, Portland.
Secretary—J. Willis Oberender, 301-2 Dekum Bldg., Portland, Ore.

Portland Local Ass'n of Electrical Contractors and Dealers
President—J. H. Sroufe, Jaggar-Sroufe Co., Portland.

Sacramento Section, California Electrical Contractors & Dealers' Association
President—W. H. Gribble, Sacramento.
Secretary—H. Berg, Sacramento.

Utah Society of Electrical Contractors and Dealers
President—J. V. Buckle, Buckle Electrical Co., 70 E. 1st St., Salt Lake City.
Secretary—E. H. Eardley, Eardley Bros. Co., 37 E. 1st St., Salt Lake City.
Meetings—Every Friday noon at Commercial Club.

Washington Ass'n of Electrical Contractors and Dealers
President—V. S. McKenny, NePage & McKenny Co., Armour Bldg., Seattle, Wash.
Secretary—Forrest E. Smith, Seattle, Wash.
Meetings—Quarterly—second Thursdays of March, June, September and December.

JOBBERS' ASSOCIATIONS

Electrical Supply Jobbers Association
General Secretary—Franklin Overbagh, 411 So. Clinton St., Chicago, Ill.
Meetings—Semi-annual.

Pacific Coast Electrical Supply Jobbers
President—W. S. Berry, Western Electric Company, San Francisco.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—Quarterly.

Electrical Credit Ass'n of the Pacific Coast
President—C. L. Gilson, Gilson Electrical Supply Co., 304—12th St., Oakland, Cal.
Secretary—Albert H. Elliot, 544 Market St., San Francisco.
Meetings—annually; San Francisco; May.

OF ELECTRICAL INTEREST

California Electrical Cooperative Campaign
Chairman Advisory Committee—L. H. Newbert, 445 Sutter St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.

National Electric Light Association
President—W. F. Wells, Edison Elec. Illuminating Co., Brooklyn.
Executive Secretary—T. C. Martin, 33 W. 39th St., New York City.

Nevada Section, N. E. L. A.
Chairman—Geo. A. Campbell, Reno, Nev.

Pacific Coast Section, N. E. L. A.
President—Samuel Kahn, Western States Gas & Electric Co., Stockton, Cal.
Secretary—A. H. Halloran, Journal of Electricity, Crossley Bldg., San Francisco.
Meetings—Annually, in April.

Portland Section, N. E. L. A.
Chairman—H. H. Schoolfield, Pacific Power & Light Co., Portland.
Secretary—F. H. Murphy.

Illuminating Engineering Society
President—George A. Hoadley.
Secretary—Clarence L. Law.
Western Representatives—Romaine Myers, Bacon Bldg., Oakland, Cal.; C. M. Masson, Edison Bldg., Los Angeles; F. H. Murphy, Portland Railway Light & Power Company, Portland, Ore.; W. R. Putnam, Utah Power & Light Company, Salt Lake City; Fred A. Osborn, University of Washington, Seattle, Wash.
Meetings—First Tuesday each month.

New Mexico Electrical Association
President—M. R. Buchanan, Silver City, N. M.
Secretary—E. M. Haggerson, Silver City, N. M.
Meetings—Annually, in February.

Southwestern Electric and Gas Association
President—W. A. Sullivan, Shreveport, La.
Secretary—H. S. Cooper, 403 Slaughter Bldg., Dallas, Texas.

Northwest Electric Light and Power Ass'n
President—L. B. Faulkner, Olympia Light & Power Co., Olympia, Wash.
Secretary—Geo. L. Myers, 1212 Spalding Bldg., Portland, Ore.
Meetings—Convention held annually. Executive Committee, governing body of Association, meets upon call of its chairman.
New officers announced later.

Los Angeles Jovian Electrical League
President—A. E. Peat, San Joaquin Light & Power Corp.
Secretary—Frank Weiss, Los Angeles Gas & Electric Corp.
Meetings—Every Wednesday, 12 m.

San Francisco Electrical Development League
President—Garnett Young, 612 Howard St., San Francisco.
Secretary—J. W. Redpath, Rialto Bldg., San Francisco.
Meetings—Every Monday, 12:10 p.m.; luncheon, Palace Hotel.

Electric Metermen's Association
President—J. E. Bridges, Westinghouse Electric & Manufacturing Company.
Secretary—A. E. Coney, Great Western Power Company, San Francisco.
Meetings—About every 60 days.

Alameda County Electrical Club
President—George Drew, Pacific States Electric Company, Oakland, Cal.
Secretary—George B. Furniss, Pacific Gas & Electric Company, Oakland, Cal.

Synchronous Club
Secretary—H. N. Beecher, City Hall, L. A.

Telephone and Telegraph Society of the Pacific Coast—San Francisco Section
President—W. H. Brammage, Pacific Tel. & Tel. Co., San Francisco.
Secretary—Chas. H. Dodson, 835 Howard St., San Francisco.

MECHANICAL ENGINEERS

National Officers
President—Charles T. Main, Engineering Society Bldg., New York City.
Secretary—Calvin W. Rice, Engineering Society Bldg., New York City.

San Francisco Section, A. S. M. E.
President—E. C. Jones, Pacific Gas & Electric Co., San Francisco.
Secretary—Geo. L. Hurst, Bethlehem Ship Bldg. Corp., Ltd., San Francisco.
Meetings—Quarterly.
Thursday lunches have been arranged at the Engineers' Club, 57 Post St.

Los Angeles Section, A. S. M. E.
President—Charles H. McGuire.
Secretary—T. J. Royer.
Meetings—Quarterly.

ENGINEERS' CLUBS

Oregon Society of Engineers
President—Orrin E. Stanley, Box 973, Portland, Ore.
Secretary—C. J. Hogue, Box 973, Portland, Ore.
Meetings—Annual: Feb. 4, 1918. Monthly: Third Thursday of each month.

The Engineers' Club of Seattle
President—H. E. Horrocks, Seattle, Wash.
Secretary—E. J. Bartells, Northern Life Bldg., Seattle, Wash.
Meetings—Thursday noon at the club rooms at 410 Arctic Bldg. A buffet luncheon is served every day. A special welcome is extended to all engineers visiting the city.

Engineers' Club of San Francisco
President—A. E. Chandler, New Call Bldg., San Francisco.
Secretary—J. R. Brownell, 525 Market St., San Francisco.
Annual Meeting: October.

Idaho Society of Engineers
President—W. H. Gibson, Mountain Home, Idaho.
Secretary—Ira F. Shaffner, Boise, Idaho.

Engineers' Club of Oakland
President—R. S. Chew, Oakland Chamber of Commerce, Oakland.

Engineers' Club of Sacramento
President—George S. Nickerson, 914 Forum Bldg., Sacramento.
Secretary—P. M. Noeboe, State Department of Engineering, Forum Bldg., Sacramento.

United Engineering Societies of San Francisco
Chairman—C. D. Marx, Stanford University.
Secretary—Nathan Bowers, Rialto Bldg., San Francisco.

MISCELLANEOUS

American Ass'n for the Advancement of Science—Pacific Division
President—D. T. MacDougal, Director Desert Laboratory, Carnegie Institution, Tucson, Arizona.
Secretary (acting)—J. R. Douglas, 430 Library, University of California, Berkeley, Cal.
Meetings—Annual.

Portland Section A. S. C. E.
President—P. H. Dater, Eng. U. S. Forestry Service.
Secretary—C. P. Keyser, Park Bureau, Portland, Oregon.
Meetings—At call of president.

Spokane Engineering & Technical Ass'n
President—J. C. Ralston, E. M., E. E.

Foreign Trade Club
President—W. H. Hammer, Monadnock Bldg.
Secretary—Wm. E. Hague, Monadnock Bldg.
Meetings—238 Merchants Exchange Bldg., San Francisco. Every Wednesday evening.

Pacific Coast Gas Association
President—John D. Kuster, care Pacific Gas & Electric Co., San Jose, Cal.
Secretary—Henry Bostwick, 445 Sutter St., San Francisco.

Society for Promotion of Engineering Education
Secretary—F. L. Bishop, University of Pittsburgh, Pittsburgh, Pa.

HAPPENINGS IN THE INDUSTRY

TRADE NOTES

New Building —

The Washington Electric Supply Company is now located in its new five-story building at S. 152 Monroe, Spokane, Wash., which it recently purchased, consolidating in this location the office and retail store formerly at 907 Riverside Avenue and the warehouses formerly on the Spokane International Tracks.

This building is of slow burning material construction. directly located on the Northern Pacific tracks with facilities for loading and unloading carload shipments direct to the warehouse platform. Commodious and well arranged offices have been established on the ground floor and the remainder of the building is devoted to warehousing a complete stock of electrical merchandise. The situation is very convenient, being close to the center of the city and only two blocks from the Davenport Hotel.

Company Convention —

The Doherty organization held a recent convention in New York City on Dec. 9th to 12th at which two hundred executives from their various branches were represented. Conditions and activities were reported from each company and general problems of the organizations as brought forward by peace conditions were discussed and policies agreed upon.

Returned from London —

Lieutenant-Colonel H. M. Byllesby returned from overseas duties with the American Expeditionary Forces, arriving on the Caronia Tuesday, December 17th. Since early in the year he served as London representative of the Purchasing Board for the United States army in Europe. He has received his honorable discharge from the army and will rejoin H. M. Byllesby & Company.

A Record Shipment —

Sangamo Electric Company recently broke the record for a carload shipment of meters and meter posts by shipping 5,107 meters complete and 500 transformers, totaling 86,000 lbs. in a single car. Most of this shipment went to Argentine and Uruguay.

A 1919 Calendar —

The Youngstown Sheet and Tube Company has recently sent out a most attractive calendar for the year 1919 with an accompanying letter in the spirit of the times:

Permit us to hand you our calendar for 1919, with the hope that it may cover a year filled for you with all good things.

The World War has been won by the forces of right and justice. The problems it has created will soon be solved. Turning from tasks of

war, we shall win new victories in the arts of peace. The future will bring to all of us adequate compensation for sacrifices made in the greatest cause humanity has ever known.

For ourselves, we rejoice in the opportunity to again serve our good customers without hindrance and with facilities greatly increased by extensions made during the war in an effort to render utmost service to the nation.

Yours truly,

THE YOUNGSTOWN SHEET & TUBE COMPANY.

New Electric Heater —

Arthur & Fowler, Ritzville, Washington, are engaged in the manufacture of electric heaters. The heater was invented by Guy Arthur and Paul Fowler and is designed for heating water tanks for domestic purposes. The heater goes around the base of the tank. The electric current is kept on steadily in most cases and the water kept very hot at all hours.

Machine Plant Sold —

The Colby Engineering Company, of Portland, has completed the purchase of the Auto-Marine Machine Works and the structural steel plant of the West Steel Company, in Tacoma, and will operate them hereafter under the name of the Colby Steel Engineering Company. Headquarters of the concern will be moved from Portland to Tacoma.

Lalley Agency —

Riegel Brothers, distributors of Dodge automobiles and trucks, Spokane, have taken the agency for the Lalley electric light and power plant designed for furnishing light and power on the farm. The plant consists of a small, compact electric generator, directly driven by a gasoline engine, and a set of storage batteries of 115 ampere-hour capacity.

A Sales Dinner —

Following a sales conference, at San Francisco, of the entire sales force, The Electric Appliance Company tendered a dinner to their employes on the evening of Dec. 31 at the Commercial Club. This is an annual affair given by the company to its staff and usually takes place between Christmas and New Year's. The dinner of this year proved a particularly pleasant occasion and was enjoyed by more than fifty members of the organization.

Personal Items —

T. N. Slocum, previously with the Federal Sign Company, has joined the forces of the Pacific States Electric Company with offices at 570 First avenue South, Seattle.

H. J. Woodward, until recently with the Economy Fuse & Manufacturing Company, Henry Building, Seattle, has joined the Seattle forces of the Fobes Supply Company.

S. W. Barker, formerly with the National Carbon Company at San Francisco, has succeeded the late J. W. Leighton as representative of the company with offices at 421 L. C. Smith Building, Seattle.

Clarence P. Deming, Seattle representative, National India Rubber Company, Wire Department, 524 First avenue South, Seattle, is making a six-weeks' business trip to Boston and other eastern points.

Captain E. M. Murphy, United States Engineers, has returned to the Seattle office of the Westinghouse Electric & Manufacturing Company. He will take up the work of application of the company's product to mining and smelting operations.

W. A. Marsden, recently with A. H. Cox & Company, 307 First avenue South, Seattle, as electrical engineer and prior to that with the Pacific States Electric Company, 570 First avenue South, and **Stanley D. Howell** have taken over the Home Appliance Company. The name has been changed to the Electric Appliance Company. The present location is at 118 Spring street, where specialties are being made of Thor washers, ironers and vacuum cleaners. Eventually the concern will move to a new location near Fifth and Pine streets where a first-class electrical retail store will be conducted.

SEATTLE TRACTION CLOSES DEAL

The Seattle city council finally passed the ordinances providing for the purchase of the street car system of the Puget Sound Traction Light & Power Company, on Tuesday, December 31, 1918. The different phases of the traction deal are covered by four ordinances. The bond ordinance directs the acquisition of the street railway property of the Puget Sound Traction Light & Power Company and authorizes the issuance of $15,000,000 in utility bonds bearing 5 per cent interest to pay for the property. These bonds are to be paid in 18 annual installments beginning March 1, 1922. The purchase ordinance carries the contract of purchase with terms and conditions and also the contract for the purchase of power by either party to the contract from the other. The other two ordinances cover running rights over the city lines of Tacoma and Everett interurban cars. Corporation counsel is preparing the city's answer in the suit brought by F. W. Twitchell to prevent the council consummating the deal. As both the traction company and the city are interested in obtaining a court decision in the shortest time possible, both sides are endeavoring to facilitate the action in the Superior court where the case was filed, so that it can be sent to the Supreme Court with no unnecessary delay. Now that the deal is practically closed, so far as the city council is concerned, it develops that the city is to become the traction company's largest power customer and at the same time the company's only competitor in the electric power field in Seattle. Included in the street railway deal is a contract which binds the traction company to sell the city sufficient power to operate the street railway system for eight years at 1 cent a kilowatt. It is estimated that the city will use under this contract about 20,000 kilowatts. While the city now has contracts for all the power the municipal plants produce, the capacity of the Cedar river plant is being increased. Mayor Hanson and J. D. Ross, superintendent of the light department, have recommended the addition of another unit to the steam plant and it is proposed to go ahead with the construction of the power plant on the Skagit river as soon as the tests being made by the city engineer indicate the proper rock foundation for a dam.

NEW EDUCATIONAL COURSES OF INTEREST TO ELECTRICAL MEN

More and more opportunities for technical instruction are being offered each year by the Extension Division of the University of California. The work is particularly adapted to the needs of those obliged to work during the day and able to spend time for self-improvement in the evenings. The University's elementary extension courses along engineering lines are well attended in many of the towns and cities of California and its correspondence courses go to practically every community in the State.

Evening classes of interest to engineers are being started this month in San Francisco. One of the most important is a course on electrical machinery which will be given in the laboratory of the Polytechnic High School on two evenings a week. It is an elementary course, arranged for stationary engineers and all men who have to do with handling and selling electrical machines.

The class will start at 8:20 p.m. Tuesday, January 14th and will meet at the same hour on Tuesdays and Fridays for 15 lessons. At the conclusion of the course the class will be immediately reorganized for advanced work along the same lines.

The study will include the elements of electric circuits, simple circuit generators and motors, transformers, control apparatus, protective apparatus and alternating current machines.

Other courses of importance to engineers are Applied Mechanics and Reinforced Concrete engineering. These

courses run from 7 to 8 o'clock on Monday evenings in Room 312, Lick Building, commencing January 20th.

The work in applied mechanics considers subjects from the standpoint of structural designing and is particularly arranged to supplement the work in reenforced concrete. In the latter course the topics taken up include: Bending moment, shear, fiber stresses, columns, comparison of wood and steel with reenforced concrete beams, properties of concrete, general theory of reenforced beams, etc. Each course consists of 15 one-hour lessons.

Other engineering and technical courses starting this month in San Francisco include: Oxy-acetylene welding, automobiles, marine engineering, farm tractors, automobile electricity and chemistry.

Those interested are invited to visit the University Extension's office, 599 Market street, corner of Second.

CENSUS OF CENTRAL ELECTRIC LIGHT AND POWER STATIONS

Preliminary figures from the forthcoming quinquennial report on the central electric light and power stations of the states of Wyoming and Arizona have been given out by Director Sam. L. Rogers, of the Bureau of Census, Department of Commerce. They were prepared under the supervision of Eugene F. Hartley, Chief Statistician for Manufactures.

The statistics relate to the years ending December 31, 1917, 1912 and 1907, and cover both commercial and municipal plants. They do not, however, cover electric plants operated by factories, hotels, etc., which consume the current generated; those operated by the federal government and state institutions; nor plants that were idle or in course of construction.

The number of establishments in Wyoming shows a most decided gain since 1907. This increase is almost wholly confined to the five-year period of 1912 to 1917, for which 23 new establishments were reported, 13 commercial and 10 municipal. All of the 20 establishments shown for 1912 were reported also for 1917. From 1912 to 1917 the total income increased $429,826, or 70.8 per cent, and the output of stations 15,852,456 kilowatt hours, or 136.9 per cent. From 1907 to 1917 the corresponding increases were $285,515, or 91.2 per cent, and 6,081,483 kilowatt hours, or 110.6 per cent. Not only the number of employes but their average annual compensation has increased from census to census.

The commercial use of electricity in Arizona shows a remarkable increase at each census for which statistics are presented. There was an increase of 13 in the number of establishments from 1912 to 1917, four of which were municipal, this class of stations being shown for Arizona for the first time at the census of 1917. From 1912 to 1917 the total income increased $986,447, or 82.5 per cent, and the output of stations 32,771,669 kw-hr., or 99.4 per cent. Although the actual increases from 1907 to 1917 were less—$603,336 and 23,567,782 kw-hr. respectively—the proportional increases—105.9 per cent and 250.9 per cent, respectively—were greater. The figures are shown in detail in the accompanying table.

CENTRAL STATIONS IN WYOMING

	1917	1912	1907	Per cent of increase[1] 1907-1917	1912-1917
Number of establishments	43	20	18	138.9	115.0
Commercial	31	18	18	72.2	72.2
Municipal	12	2	.....	.....	500.0
Income	$1,036,921	$607,095	$317,580	226.5	70.8
Electric service	951,101	595,465	303,683	213.2	59.7
All other	85,820	11,630	13,897	517.5	637.9
Total expenses, including salaries and wages	$894,375	$445,789	$235,846	279.2	100.6
No. of persons employed	261	163	96	171.9	60.1
Salaries and wages	$259,786	$149,356	$ 77,811	233.9	83.9
Total horsepower	27,462	11,596	5,125	435.8	136.8
Steam engines:					
Number	56	45	34	70.6	28.9
Horsepower	22,837	10,162	4,360	423.8	124.7
Internal-combust'n engines:					
Number	23	1	.....	.....	2200.0
Horsepower	1,937	100	.....	.....	1837.0
Water wheels:					
Number	12	11	6	100.0	9.1
Horsepower	2,688	1,334	755	251.4	101.5
Kw. capacity of dynamos	20,627	8,212	3,208	543.0	151.2
Output of stations, kw-hr.	27,433,023	11,580,567	5,499,084	398.9	136.9
Stationary motors served:					
Number	826	672	131	530.5	22.9
Horsepower	14,957	6,224	685	2083.5	140.3
Number of street lamps:					
Arc	339	396	(2)	.....	—14.4
Incandescent, etc.	3,728	1,168	(2)	.....	219.2

(1) A minus sign (—) denotes decrease.
(2) Not available.

CENTRAL STATIONS IN ARIZONA

	1917	1912	1907	Per cent of increase[1] 1907-1917	1912-1917
Number of establishments	29	16	15	93.3	81.3
Commercial	25	16	15	66.7	56.3
Municipal	4	....	....	.....	.....
Income	$2,141,633	$1,173,186	$569,850	275.8	82.5
Electric service	1,888,954	1,128,862	544,192	247.1	67.3
All other	252,679	44,324	25,658	884.8	470.1
Total expenses, including salaries and wages	$1,752,154	$923,258	$464,350	277.3	89.8
No. of persons employed	436	217	148	194.6	100.9
Salaries and wages	$451,163	$219,798	$130,663	245.3	105.3
Total horsepower	38,662	22,075	7,746	399.1	75.1
Steam engines:					
Number	28	33	32	—12.5	—15.2
Horsepower	23,870	12,775	6,926	244.6	86.8
Internal-combust'n engines:					
Number	15	.....	3	400.0	.....
Horsepower	3,592	.....	70	5031.4	.....
Water wheels:					
Number	4	4	4	.....	.....
Horsepower	11,200	9,300	750	49.3	20.4
Kw. capacity of dynamos	26,972	14,756	4,939	446.1	82.8
Output of stations, kw-hr.	65,731,753	32,960,084	9,392,302	599.8	99.4
Stationary moters served:					
Number	1,364	741	339	302.4	84.1
Horsepower	16,050	12,547	2,220	643.5	31.5
Number of street lamps:					
Arc	430	454	(2)	.....	—5.3
Incandescent, etc.	4,194	1,335	(2)	.....	214.2

(1) A minus sign (—) denotes decrease.
(2) Not available.

INCREASING THE CARRYING CAPACITY OF WIRES

A letter from Theodore N. Vail, president of the American Telephone and Telegraph Company, announces the invention and development by the technical staff of the Bell System of "a practical system of multiplex telephony and telegraphy by the use of which it is now possible to increase many fold the message-carrying capacity of long telephone and telegraph wires."

With this new system four telephone conversations over one pair of wires are simultaneously carried on, in addition to the telephone conversation provided by the ordinary methods. The nature of these developments is such that, if desired, wires may be used partly for telephone and partly for telegraph. A pair of wires is available either for five simultaneous telephone conversations or for forty simultaneous telegraph messages, or partly for one and partly for the other.

NEW ENGINEERING COLLEGE IN JAPAN

The Tohoku Imperial University is adding a new engineering college. This will include the departments of electrical engineering, mechanical engineering, and applied chemistry. A sum of about 500,000 yen ($250,000) will be needed for equipment. The instruction will begin this winter.

THE WESTERN ELECTRIC COMPANY'S PLAN FOR FORMER EMPLOYES NOW IN MILITARY SERVICE

The Western Electric Company announces as its policy that former employes who have been given a leave of absence for military service and who have been honorably discharged therefrom and who desire to again take up work in the company, should make application within thirty days after being mustered out of service. If possible they will be promptly assigned to work for which their previous experience qualified them, at the rate of pay which others are then being paid for similar work. If it is not possible to assign them to work

immediately, they will be placed on a preferred list until such time as business conditions enable the company to place them. During their continuance on this preferred list they will enjoy the same rights with respect to the Employes' Benefit Plan as they had while in the service of the United States, and they may take other employment. When they are notified of a vacancy they should present themselves for work at the time stated and failing to present themselves for ten days thereafter their leave of absence shall terminate. Before assignment to any work, their suitable physical condition for such work must be determined in accordance with the regular routine.

A UNIVERSITY EMPLOYMENT BUREAU

A Bureau of Occupations has been established by the California Alumni Association, with its main office located at Berkeley, California. Its purpose is to aid employers to choose from the graduates of the University of California workers who will meet their requirements. The bureau is now registering men and women and is prepared to furnish workers, many of them highly skilled in professions, as well as recent graduates. No fees are charged.

REPORT OF CALIFORNIA WATER COMMISSION

The California State Water Commission, in its second biennial report, just issued, is making the unique recommendation that the salaries of two of its three $5000 a year commissioners be abolished. The commission is composed of A. E. Chandler of Berkeley, president, W. A. Johnstone of San Dimas and Irving Martin of Stockton. The water commission act became effective December 14, 1914. It provided for three commissioners at a salary of $5000 per year, and Governor Johnson appointed the three men named. After four years of experience the commission is now recommending its own reconstruction. The seventeen western states which are thought of as "irrigation states" are: Arizona, California, Colorado, Dakota, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, and Wyoming. Arizona and Montana are the only two in which water codes have not been adopted calling for the initiation of rights, the adjudication or determination of rights and the distribution of water among those entitled to its use. In the remaining fifteen states, applications to appropriate water must be made to a central office, which office in various states is termed state engineer, water commission or water board. The most important work of these central offices is the initiation of rights, or the control of new appropriations. In this connection the commission recommends:

> "In practically all of the irrigation states a single officer has authority to pass upon applications to appropriate water, with provision for the right of appeal to the water board. As the work of passing upon applications to apropriate will require the greatest expenditure of time by the commission, in the interests of economy and administrative efficiency, it is recommended that the formation of the commission be changed to include one executive member on a stated salary, and two associate members on a per diem basis. The executive member shall have exclusive power to act upon all applications to appropriate, subject to appeal to the full commission. The associate members shall perform all the duties now imposed upon members of the commission, except that they shall have jurisdiction over applications to appropriate in cases of appeal only."

It is understood that the commission proposes to follow up its recommendation by submitting to the legislature the necessary enabling proposals to make its recommendation effective.

In the matter of the use of water, and as indicating that a permit cannot be held for speculative purposes, the commission quotes from the act as follows:

> "When the party entitled to the use of water fails to beneficially use all or any part of the water claimed by him, for which a right of use has vested, for the purpose for which it was appropriated or adjudicated, for a period of three years, such unused water shall revert to the public and shall be regarded as unappropriated public water."

It is therefore evident that a person obtaining a water right must continue to apply the water to beneficial use, otherwise his right is forfeited.

In the administration of water law, there are three important steps: The initiation of new rights, the adjudication of existing rights and the distribution of water to those legally entitled to its use. The commission is now in the second phase of the work, and is engaged in making an adjudication and determination of the rights on the Stanislaus River. This will be the first adjudication, and will serve as a basis for work in the future. The Stanislaus is an important stream both from the standpoint of power development and irrigation, and the commission entered upon the adjudication of this river on the joint petition of the South San Joaquin and Oakdale Irrigation Districts. The field work in connection with the examination of a stream system includes the survey of irrigated land and the measurement of streams and ditches. The survey and maps of the Stanislaus have been completed and claimants of water rights are now submitting proofs of appropriation. At the 1917 session of the legislature that part of the water commission act dealing with the determination of water rights was amended so that it now follows closely the procedure of Oregon and Nevada, the water legislation of which states has been upheld by the state and federal courts. The ascertainment proceedings under the statute are restricted to the determination of rights by appropriation, and only those riparian owners who desire to appear as appropriators need file claims. No riparian right is affected by the determination. It is the theory of the commission, and carried out in practical operation, that those having water rights be saved all possible trouble and expense for legal advice, surveys, measurements, etc., except where the parties interested are unable to agree with the accuracy of the surveys or measurements made by the commission.

The water commission cooperates with the U. S. Geological Survey in stream measurement work, and makes a considerable appropriation from its own funds for this purpose. The records thus obtained are very valuable as indicating the waters in the streams available for appropriation. The commission is also cooperating in irrigation investigations with the U. S. Department of Agriculture. Very valuable results have been achieved in this direction, as showing the duty of water in rice irrigation in the Sacramento Valley. The results of the experiments are printed in bulletins and are available to those interested.

The commission is renewing the recommendation made in its last biennial report for further legislation regarding the control of the distribution of water to those entitled to its use. This is the third step in water legislation. With the exception of Arizona, California and Nevada, this necessary machinery is provided in the water codes of all the irrigation states. The present act provides that the commission shall have power to supervise the distribution of water, but fails to provide the necessary machinery. To cure this defect is the purpose of the recommendation of the commission. The beneficial results of supervision are afforded in a citation by the commission of the West Fork of the Carson River, an interstate river rising in California and flowing into Nevada. The distribution of the water is under supervision in Nevada, but is not supervised in California, and the results on the two streams furnishes a very instructive object lesson.

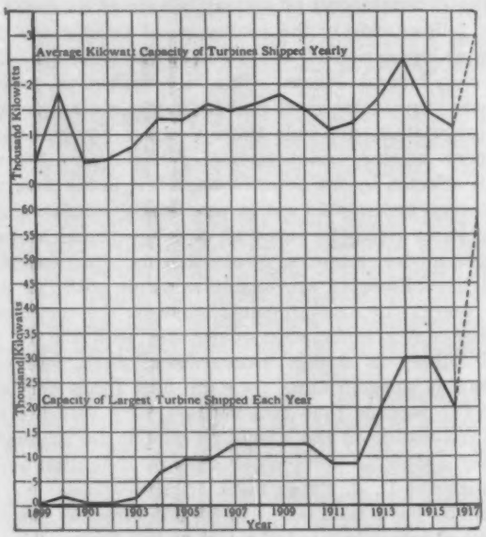
The commission states that it is apparent from the number of inquiries received, that there is vital need for legislation which would permit a party, even though not engaged in public service, the right of eminent domain for rights of way for ditches, it being necessary for any one who desires to appropriate water to show right of access to his proposed point of diversion. Hence the commission is recommending that the right of eminent domain to parties not engaged in public service be given in such terms that its meaning cannot be successfully questioned. Very frequently it happens that a person having the facility to use water, or having an available diversion site, does not avail himself of the opportunity, and plays the dog in the manger by refusing any one else access at a reasonable compensation.

LATEST IN EVERYTHING ELECTRICAL

(The progress of the steam turbine from its origin through the last thirty years is here reviewed with charts showing the increase in capacity. The description of a motor starter and controller especially designed for use under the severe operating conditions found in mines and a report of the largest kva. capacity polyphase regulator built follow.—The Editor.)

STEAM TURBINE PROGRESS REVIEWED HISTORICALLY

Roughly speaking, the whole of the development of the steam turbine has occurred within thirty years. This is a very brief period as compared with the development of the reciprocating engine, which occurred over a period of more than ninety years. Many are inclined to attribute this to


Average Kilowatt Capacity of Turbines Shipped Yearly
Thousand Kilowatts
Capacity of Largest Turbine Shipped Each Year
Thousand Kilowatts
1899 1901 1903 1905 1907 1909 1911 1913 1915 1917
Year

A chart showing the capacity of the turbines shipped yearly by the Westinghouse Electric & Manufacturing Company from 1899 to 1917.—Fig. 1.

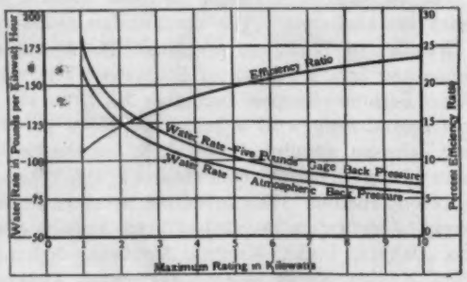
the high technical skill and scientific attainment of the present age, but a more true reason than this is the fact that metallurgical and manufacturing arts were available for the turbine manufacturer which were not available for the early builders of steam engines.

Fig. 1 shows the increase in the capacity of single units as built from year to year. The average capacity of turbines is also shown; it has not, however, been continuously an upgoing scale on account of the growth of business in single wheel impulse turbines of small capacity. In 1909 was commenced the development of small, single disc, non-condensing turbines of the reentry type, intended primarily for the operation of condenser auxiliaries. Their general performance was so encouraging that in the course of time a line of excellent small machines suitable for electric generator drives, and also adaptable for driving any other kind of machinery, have been developed. The smaller ones, up to 15 kilowatts, are direct connected; above that they were geared. The general performance is shown by Fig. 2. The past two decades have seen a growth in the size and economy of steam turbines beyond the most optimistic expectation of twenty years ago, as is shown graphically by the charts.

Progress and Future Possibilities

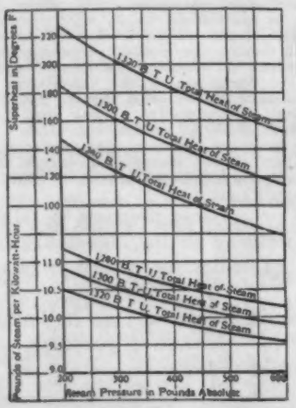
Discussion of the general progress of turbine development in the past is not complete without reference to the possibilities of the future. It is plain that with turbines of large size, which deliver to the switchboard 76 to 80 per cent of the theoretical energy available from the steam expanding between the limits specified, further improvements in the turbine itself will not materially raise this efficiency, and that further improvement in central station economies must be looked to from causes other than the steam turbine. This is a subject of the greatest importance in view of the rapidly increasing cost of fuel and justifies considerably more capital expenditure for economizers and other plant apparatus which will reduce fuel cost.

Attention at the present time is being directed to employing higher boiler pressures, viz., pressures as high as 600 pounds. Today 200 pounds pressure, 200 degrees F., superheat is regarded as a more or less every day operating condition for large plants. Steam generated at 600 pounds pressure, having exactly the same heat content as that contained in 200 pounds pressure and 200 degrees F. superheat, will have a superheat of approximately 128 degrees F. This



A diagram illustrating the general performance of the smaller types of turbines

expanded to 29 inches of vacuum is theoretically capable of giving 13 per cent more energy than when generated at 200 pounds. Doubtless, when operating under these conditions, the turbine will be of lower efficiency. The high pressure element will be less efficient on account of the great density and the small volume of steam, and on the other hand the low-pressure elements will be less efficient because of the great amount of water precipitated by the steam expansion


Superheat in Degrees F
1320 B T U Total Heat of Steam
1300 B T U Total Heat of Steam
1280 B T U Total Heat of Steam
1260 B T U Total Heat of Steam
1300 B T U Total Heat of Steam
1270 B T U Total Heat of Steam
Pounds of Steam per Kilowatt-Hour
Steam Pressure in Pounds Absolute

Steam generated under the high pressure of 600 pounds will have a superheat of approximately 128 degrees F. This expanded to 29 inches of vacuum is capable of giving 13 per cent more energy than when generated at the usual pressure of 200 pounds. Allowing for a loss in efficiency, the turbine will avail itself of at least 50 per cent of this possibility, producing a net saving of from 6 to 7 per cent.

from the high pressure, introducing a brake in the turbine. However, it is reasonable to suppose that the turbine will avail itself of at least 50 per cent of this 13 per cent possibility, producing a net saving of 6 or 7 per cent. What may be expected to be derived from higher pressures is exhibited in Fig. 3, plotted for various pressures.

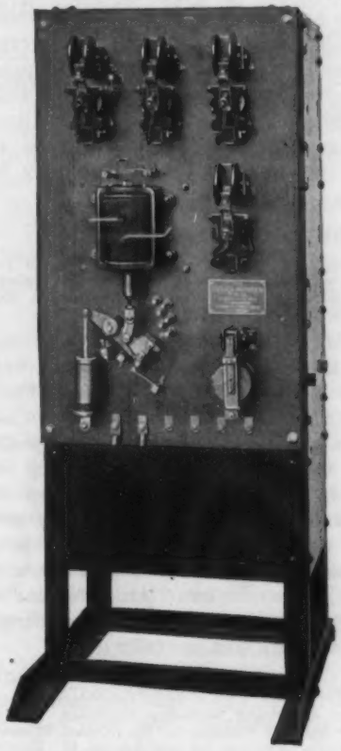
To make similar comparison between a modern large turbine installation and the best performance of reciprocating engines, assume:

	Turbines	Engine
Initial cost per kw. of the generating units	$ 8.00	$40.00
Fixed charges, per cent	.15	.15
Pounds steam per kw-hr.	.11	.17
Cost of steam per thousand pounds at 220 pounds 150 degrees superheat, 175 pound dry sat.	.15	.14
Load factor	.75	.75
Cost of foundations per kw.	.50	2.50
Cost of condensers per kw.	3.50	2.50
Cost of engine room personnel, not including executive administration, per kw. per year	.61	1.57
Oil and engine room supplies per kw. year	.10	1.34
Total cost per kw. year	$13.34	$25.29

The modern large turbines have therefore accomplished a saving over the best reciprocating engine installation of approximately 47 per cent. The cost of energy has been no doubt reduced to one-half, if consideration is given to reduced size of buildings, etc.

MINE DUTY STARTERS

On account of the injurious effects of moisture present in mines and the severe operating conditions, special care should be used in the selection of motor starters and controllers, particularly the starters and controllers for the ventilating fan and pump motors, as in most mines these two pieces of apparatus must be kept in continuous operation to free the mine of water and exhaust the dangerous gases. Another condition which affects the operation of motor starters is the wide fluctuations in generator or line voltage caused by mine hoists and locomotives. For these reasons the standard design of hand or automatic starter will not operate satisfactorily and a starter should be selected which is especially adapted to operate under such conditions.



A mine duty self-starter designed for mine use with ventilating fans or pump motors.

The accompanying illustration shows a Mine Duty Self Starter manufactured by the Cutler-Hammer Manufacturing Company of Milwaukee, which has recently been redesigned and which embodies several operating and protective features essential to the continuous operation of a ventilating fan or pump motor.

Plain hand starters and starters without self-resetting features will drop to the "off" position every time a large drop in voltage occurs; this of course stops the motors controlled by them and serious results may follow. When a motor receives current at a voltage considerably lower than its rated potential it will slow down, and stop when this voltage drops to a certain value or when the current is "off." Control apparatus is required that will automatically insure the continuous running of the pumps and fans, even if at reduced speeds, and will also restart them after a complete interruption and subsequent resumption of current supply.

To meet these conditions the starter illustrated, which is a pilot switch accelerator type for motors up to 100 h.p., is equipped with a rugged relay which is very sensitive and positive in its action. This relay guards against injury to the motor; it causes all of the armature resistance to be inserted in case of a bad drop in voltage, thus checking the heavy current resulting from the decreasing counter electromotive force. If the line pressure falls to about 80% of normal the relay drops out, opening the control circuits to the accelerating switches which drop in turn and cut into circuit the heavy duty starting resistance, which has capacity for continuous service at low voltage. The motor then runs at slow speed until the voltage increases and at about 90% normal the relay pulls in again, cutting out the the resistance and permitting the motor to accelerate to normal full speed.

A single coil overload, where shunt wound motors are used, can be added to also insert the armature resistance in case of an overload and thus keep the fan or pump going at a reduced speed. This single-coil overload and the voltage relay prevent the shunt motor from flashing over under severe voltage fluctuations. When the voltage drops to a very low value the motor tends to run as a generator and is liable to "flash over" across the brushes, injuring the motor and commutator. With a compound motor the overload is not so necessary because when the motor tends to run as a generator, the compound winding opposes the shunt winding, neutralizing the field and preventing those conditions which result in "flashing over."

POLYPHASE INDUCTION REGULATORS

The largest kva. capacity polyphase regulator ever built was completed for the Hartford Electric Light and Power Company of Hartford, Conn. The rating is 1000 kva, three-phase, 60 cycles and provides 10 per cent regulation on a 10,000 kva, 11,000 volt, three-phase, 526 ampere circuit. The regulator is an oil immersed, forced-oil-cooled type, which is a new but very successful departure in the method of cooling regulators.

In this method of cooling, the cold oil is forced in at the bottom of the regulators through the lower portion of the windings, which extend below the core, and which are especially spaced so as to give a free passage for the oil. As the oil passes upward it is forced through three separate and distinct passages, each passage being of such size as to allow a flow of oil in proportion to the heat generated.

One oil passage is inside the rotor iron along the rotor shaft, one outside the stator iron between the regulator and the tank, and the third through the gap between the shunt and series windings. After passing through the upper portion of the windings, which are spaced in the same manner as the lower portion, the oil overflows into a channel along the inside of the tank. In order that the flow into the channel be uniform from all directions a special distributor is provided. From the channel the oil is conducted by gravity through a series of cooling coils to a storage tank and from the storage tank is again forced through the regulator.

The regulator is of the skeleton frame design with a sturdy mechanical construction.

The conductors of the windings are heavily insulated and the insulation on the outside of the coils is in proportion. The strand insulation of the shunt winding is exceptionally strong and additional insulation is used between layers. The series of coils are of one turn per layer and the turns are insulated from each other with insulation which will withstand a potential greater than the full line voltage.

In order to allow free passage of the oil through the coil insulation into the coil, each coil is provided with a vent at the bottom. In addition the complete machine is given a vacuum oil treatment to remove any air pockets that may exist in the coils.

BOOKS AND BULLETINS

Ocean Cable Systems

Preliminary figures of the forthcoming quinquennial report on the ocean cable systems of the United States have been given out by Director Sam. L. Rogers, of the Bureau of the Census, Department of Commerce. They were prepared under the supervision of Eugene F. Hartley, chief statistician for manufacturers. The companies making up the Ocean Telegraph totals for 1917 are, as in 1912:

Central and South American Telegraph Company
Commercial Cable Company of Cuba
Commercial Cable Company of New York
Commercial Pacific Cable Company
Mexican Telegraph Company
United States and Hayti Telegraph and Cable Company

The statistics relate to the years ending December 31, 1917, 1912 and 1907, and are subject to such revision as may be necessary after further examination of the original reports.

The figures show that for the five years 1907 to 1912, as well as for ten years, 1907 to 1917, there were substantial gains. During the five years the gains in the extent of ocean cable telegraphic traffic was $7,597,272, or 94.2 per cent; and in net income $3,554,022, or 120.4 per cent. The ten year gain in these respects was $8,324,790, or 113.4 per cent, and $2,477,795, or 61.5 per cent, respectively.

The amount of capital stock outstanding in 1917 was $60,900,000, or 9.8 per cent greater than in 1912. The gain in this respect during the ten years was $8,100,000, or 15.3 per cent. The number of employes, salaried and others, increased 310, or 18.7 per cent during the five years, and their total salaries and wages $597,337, or 51.2 per cent. For the ten years the increase in number was 759, or 62.9 per cent, and in salaries and wages $849,268, or 92.8 per cent.

Government Publications

The details of Germany's activities in the Bolshevik revolution are published in bulletin No. 20 of the War Information Series issued by the Committee on Public Information.

"The Present Development of Transmission Lines in Kansas" is taken up in Engineering Bulletin No. 10 of the University of Kansas, with an appendix on "The Calculation of Iron Wire Lines" by F. Ellis Johnson.

"The Relative Corrosion of Cast-iron, Wrought-iron and Steel Pipe in House Drainage Systems," a paper by Wm. Paul Gerhard, is published by the American Society of Mechanical Engineers as an advance paper for the convention in New York City recently past.

G-E Bulletin

Rheostat and Compensator Mechanisms form the subject matter of bulletin No. 47702 of the Schenectady Works of the General Electric Company. The bulletin is profusely illustrated and will prove of value to those purchasing such machinery.

Miscellaneous

Display boards for supply parts are advertised in a recent bulletin by the Universal Fixture Corporation.

"California Mineral Production for 1917" with county maps forms the subject of Bulletin No. 83 of the California State Mining Bureau.

Tungsten, Molybdenum and Vanadium in California are discussed in a recent publication of the California State Mining Bureau. A supplementary bulletin takes up the Antimony, Graphite, Nickel, Potash, Strontium and Tin in their occurrence in the state.

Annual Report

The Seventh Annual Report of the Toronto Electric Commissioners on the Toronto Hydroelectric system has recently been issued, with complete statistical information for the year ending December 31st, 1917.

Graphic Instruments

A recent bulletin issued by the Esterline Company features a new type of graphic instrument for checking the operation of electrical and mechanical apparatus, a portable graphic power factor meter and a new duplex portable indicating instrument. These instruments are of particular interest in view of the day's interest in the improvement of efficiency in plants and individual machines.

Mine Duty Self-Starters

Mine Duty Self-Starters is the title of a new two-page descriptive leaflet known as publication 408, which is being distributed by The Cutler-Hammer Manufacturing Company of Milwaukee. These Mine Duty Self-Starters are divided into two chief types, both of which are illustrated. In one, the motor is brought up to speed by the action of a solenoid, which draws a pivoted arm over sliding contacts, thus cutting out resistance in the armature circuit and increasing the speed of the motor. The other type uses magnetic clapper type switches in place of the sliding contacts, the switches being closed in the proper sequence by a pilot switch which in turn is operated by a solenoid. The magnetic switch type is intended for motors above 15 h.p. Both types are equipped with magnetic main switches and voltage relays. A C-H Unit Charging Rack for miners' electric lamps is also illustrated. Each rack accommodates 1 to 10 batteries and as many of these units may be installed together as may be necessary.

McGraw Electric Railway List, August, 1918

by the Electric Railway Journal, published semi-annually. Size 4½ by 8½ in.; 272 pages; published by the McGraw-Hill Book Company, New York, and for sale by the Technical Book Shop, San Francisco. Price $4.00.

The list is one compiled by the Trade Investigation and Directory Department of the Electric Railway Journal and is a complete and valuable reference work. It includes Canada, Mexico, Hawaii, Cuba and the Philippines and gives all operating and holding companies with officials and department and operating heads, the cities and towns connected by inter-urban lines, the population of cities served, number of cars and miles of track, and data on the power plant and substation equipment. In addition, an appendix gives data on Electric Railway Associations and on National and State Railroad and Public Utility Commissions. An unfortunate transposition of pages 211 and 214 is somewhat confusing, but the book as a whole is accurate and carefully edited.

Gas and Flame in Modern Warfare

by Major S. J. M. Auld of the Royal Berkshire Regiment, and a member of the British Military Mission to the United States; size 5 x 8 in.; 202 pages; published by the George H. Doran Company, New York, and for sale by the Technical Book Shop, San Francisco. Price $1.35.

A fascinating account of the development of defensive and offensive methods in gas and flame warfare, as recounted by the man who has been in touch with gas warfare from the beginning. Major Auld is a chemist who volunteered for service at the outset of the war. Some months after the first gas attack he was taken into the Gas Service, and later became Chief Gas Officer to Sir Julian Byng's army. More recently he has been in the United States at the request of our government, teaching the American army methods of the new science.

The book takes up the experiences of the first few weeks and the experimentation to determine the best method of defense, and then the later developments with each new type of gas used. The subject matter is of the greatest interest and the author's style highly entertaining.

NEW ELECTRICAL DEVELOPMENTS

(The adjustment of car fare rates in the Northwest is still a matter of agitation. Plans for construction in Spokane are revised in view of the contract with the Puget Sound Traction Light & Power Company. In the Pacific Central district various pumping installations for irrigation projects are under way and considerable activity is reported from the Southwest and Intermountain District.—The Editor.)

THE PACIFIC NORTHWEST

SPOKANE, WASH.—The Northwest Aircraft Company has been incorporated here for $50,000 by C. B. Merriam, Harry Goetz, et al.

JUNEAU, ALASKA.—The Chicago Mining Company is considering plans for the erection of a new power plant at its properties for operation.

HUNTERS, WASH.—The electric light plant and the residence of A. Waterbury were destroyed in a recent fire. Property loss is about $3500.

SPOKANE, WASH.—The Universal Electric Company has recently been incorporated for $10,000 by C. F. Uhden, G. W. Crowder and A. E. Russell.

KLAMATH FALLS, ORE.—It is expected that a large dam will be constructed next year by the California-Oregon Power Company, at the head of Link River.

TACOMA, WASH.—On January 1st the city of Tacoma took over from the Tacoma Railway & Power Company the operation of the tide flats car line which the company had been operating for the city.

SEATTLE, WASH.—Bids will be received by the Port of Seattle Commission up to February 9th at 2 p.m. for a Gantry electrically operated crane for Pier "B" at Smith's Cove terminal, to cost about $90,000.

OAKVILLE, WASH.—Rodney Maxwell, a civil engineer of Elma, has been looking over the site for the new light and power plant which the town is planning on installing soon. Maxwell stated that a longer dam built on the Roundtree Creek below the one supplying city water would cost $1,500.

FOSSIL, ORE.—The Fossil Milling Company was organized recently, among other movements for the development of this place. The objects of the new concern are the furnishing of light and power and the manufacture of flour. They have purchased the Fossil Flour Mill property including all the machinery and electric light equipment, and have sent to Portland for additional machinery.

SPOKANE, WASH.—Believing that the city has no immediate need of additional substations for the lighting department now that it is able through the traction deal to buy current from the Puget Sound Traction Light & Power Company, Mayor Hanson states that he will veto two ordinances recently passed by the council, one appropriating $15,000 to buy a site in the tide lands for a new substation and the other appropriating $10,000 to complete the ballard station.

TACOMA, WASH.—The 7-cent fare has not been of sufficient avail to prevent a deficit in the returns of the Tacoma Railway & Power Company, according to the latest report of the manager, L. H. Bean. The deficit of the company for the five months of 7-cent fares has been $164,739 while for six months under 5-cent fares the deficit was only $95,726.52. This showing was made by an increase of 51.30% in wages to the car men and in increasing the service 72%.

SEATTLE, WASH.—Immediate construction of a permanent station for the Everett interurban cars at a cost of $100,000, at the southeast corner of 6th avenue and Olive street, this city, has been announced by A. W. Leonard, vice-president of the Pacific Northwest Traction Company. The structure will be erected by the Puget Sound Traction Light & Power Company. Work is to start at once and it is presumed the station will be ready for use by the coming summer.

PORTLAND, ORE.—The Pacific Power & Light Company, which operates public utilities in about 50 cities and towns in Oregon, Washington and Idaho, has disposed of an issue of $1,265,000 in five per cent first mortgage gold bonds, due August 1, 1930. The company's bonds are secured by first mortgage upon the entire physical property of the company. Net earnings for the twelve months ending November 30, 1918, were nearly twice the interest charges on all bonds outstanding.

VANCOUVER, B. C.—So far as the 1918 council of Vancouver, B. C., was concerned it announced, upon the filing of a written report from McCrossen and Harper, special counsel, that no further action would be taken regarding the six-cent fare of the British Columbia Electric Railway. The report was received by the counsel in committee and dealt with the unsuccessful injunction suit recently filed by the city. Any action on the six-cent by-law before its expiration in April will have to be taken up by the 1919 council.

TACOMA, WASH.—A report on the estimated cost of creating a storage basin on E creek near Elbe and of the flow of the water in the creek, was sent to the city council recently by Norton L. Taylor, engineer for the light department. The storage basin is wanted to allow the Nisqually power plant to run at its maximum all the year round. The basin would furnish 49,133,000 kilowatt hours of added current a year, Engineer Taylor states, at a cost of .085 cents a kilowatt hour against the present cost of .29 cents for current from the city's plant. The estimated cost of the basin, including all items, is $557,960.

SEATTLE, WASH.—The Alaska Petroleum & Coal Company, with offices in the New York building, completed last October 22 miles of railroad from the landing in the vicinity of Katalla on Controller Bay, to its anthracite coal mines which have been opened by constructing haulage tunnels to the veins. It is contemplated that the coming season will find the company in position to mine 500 tons of coal a day. In the spring rolling stock and locomotives will be shipped from Seattle for the railroad. The mines are located in the Bering river region. Hydroelectric development on this is a possibility but the power sites are on the public domain and that phase of the matter would have to be adjusted.

VICTORIA, B. C.—Engineers are now on the ground running lines and securing data for the drafting of the plans of the hydroelctric plant which the provisional government will install at Squamish to provide power and light for the Pacific Great Eastern terminal plant there, as well as for the town of Squamish. The enterprise, which will call for an outlay of between $40,000 and $50,000, will be of great importance to the town besides improving the facilities at the car repair shop and roundhouse of the government-owned railway line. The late owners of the road contemplated a similar plant but on a much larger scale and a considerable portion of the equipment bought by them is still available. The company had intended to secure its water power from Monmouth creek but the government plans to derive its water from the Stawamish River.

SEATTLE, WASH.—According to City Engineer A. H. Dimock subways, aerial roadways and elevated car lines will soon be needed in Seattle to take care of the city's growth. The city engineer states in his annual report that new thoroughfares planned by the city should be so constructed as to provide separate accommodations for fast automobile and slower truck traffic. He would have aerial car tracks swung over the city to provide rapid access to the heart of the city. A subway under Third avenue to carry passengers from the north to the railroad depots and proposed electric stations in the south is advocated.

PORTLAND, ORE.—An increase in rates that should help materially in overcoming prevailing high operating costs has been granted the Northwestern Electric Company by the Public Service Commission of the State of Oregon. The increase, which applies to all of the company's business in the city of Portland, became effective on the first of the present month. Statisticians of the company have figured that the increase in rates will be equivalent to an increase of about $80,000 in the company's annual net earnings.

THE PACIFIC CENTRAL DISTRICT

OAKDALE, CAL.—H. A. Niedig has opened an electrical shop in the building formerly occupied by Johnson's Cyclery.

PALO ALTO, CAL.—The Board of Public Works has instructed the city engineer to proceed with the work of installing street lamps in South Palo Alto.

FRESNO, CAL.—Surveys are being made in the mountains for the San Joaquin Light & Power Corporation with a view of preparing for after-war activity.

FRESNO, CAL.—The Lewis Electric Company has been granted the contract for constructing an electrolier system in South Van Ness Avenue on its bid of $14,250. The city's estimate was $14,757.

ARBUCKLE, CAL.—An irrigation plant intended to irrigate 200 acres of orchard and which will pump 1000 gallons per minute, is planned here by the new owners of the Hobbs orchard, Tyler and Ross of Los Angeles. Work will be begun at once.

OAKDALE, CAL.—The local power plant, known as the Knight's Ferry power plant, is making improvements and betterments with intention of again placing the plant in operation, having been closed for some time past, to furnish power for shipbuilding and other industrial works in this section.

HOLLISTER, CAL.—The Coast Valley Gas & Electric Company has filed a certificate for right of way on property of 16 residents in the southern end of the county. The company is going to extend a power line from King City to the New Idria mines and it is said that work will commence in the near future.

WOODSIDE, CAL.—A meeting of all formers in Yolo county who use water from the Yolo Water and Power Company for irrigation purposes was called by Secretary Shaffer, of the board of trade. The matter of water for irrigation purposes for the summer season of 1919 was discussed with representatives of the water company.

SAN FRANCISCO, CAL.—The Sierra & San Francisco Power Company and the Coast Counties Gas & Electric Company, of Santa Cruz, are planning for the reconstruction of a number of sections of their overhead lines in compliance with a recent order from the State Railroad Commission. Application has been made to the Commission for an extension in time in which to complete the work.

PLACERVILLE, CAL.—George F. Loughland, acting manager for the Western States Electric Company, stated that petitions for electric lights and power for Diamond Springs will be favorably considered, and if the project carries satisfactorily a transformer will be installed at Diamond Springs to serve the California Door Company. The company contemplates extensive increase in their service offerings to El Dorado county during the coming year. Twin Lakes and other power stations are under construction for this purpose.

STOCKTON, CAL.—Directors of the Modesto and Turlock irrigation districts have under advisement the construction of a new storage reservoir in connection with an electric power plant, to be known as the Don Pedro storage reservoir. The plans provide for a water capacity of 260,000 acre-ft., with a hydroelectric power plant, the initial installation to have a capacity of from 6000 h.p. to 10,000 h.p.

ALAMEDA, CAL.—Application has been made by the Alameda Sugar Company and the Alameda Farms Company to the State Water Commission for permission to appropriate water from the Sacramento river in Sutter county for the irrigation of 7600 acres of land. It is proposed to install pumping plants at three different places and to connect the three plants. The cost of the work is estimated at $287,000.

NEVADA CITY, CAL.—Next season the Brandy City Mining Company intends to construct a large restraining dam so they can hydraulic their immense gravel holdings at Brandy City. The barrier will stretch a quarter of a mile across the North Yuba river, below Bullard's bar, and will be 150 feet in height. Near the dam a big power plant will be erected, which will generate electric power for operating the machinery.

NEVADA CITY, CAL.—The big River Dam on the South Yuba river, about five miles above the Rome power house, and now owned by the Pacific Gas & Electric Company, is being blasted out. The River Dam was built over twenty years ago by the Bay Power Company and was constructed without a fish ladder. Since then the law requires a fish ladder to be built on every dam and as this dam is not being used and it was found that the cost of a fish ladder was far greater than the expense of blasting it out, the company decided to destroy it.

TRACY, CAL.—The greatest part of a recent session of the city trustees was taken up in a discussion of the matter of installing electroliers along Central Avenue and the business section of Sixth Street. The matter was put up to Trustees Lang and Heil, as the committee on street lighting, to make a choice of posts for the same. Samples and estimates were furnished by the Westinghouse Electric Company and the Pacific States Electric Company, and C. S. Northcutt of the Sierra & San Francisco Power Company was present to give information as to the work of installation done by this company and the relative cost of service.

OROVILLE, CAL.—According to reports received here from Concow Valley, the Pacific Gas & Electric Company is preparing to begin the development of a storage proposition there for power and irrigation purposes. It is said surveys have been completed and that the plans of the company contemplate a dam to impound the water covering an area of 2500 acres. This water is to be fed into the ditch that now serves Oroville. The valley was originally used as an impounding reservoir to supply water during the era of large hydraulic operations in Cherokee. The dam gave way a number of years ago, and since then has not been repaired.

REDDING, CAL.—That the project of building great power plants in Pit river above Copper City for electrifying the Southern Pacific is rapidly unfolding is shown by an instrument filed for record on Dec. 20th. The Central Pacific contracts to sell to the Pit River Power Company 6,447 acres of land along Pit river above Copper City and extending to the big bend for $194,093. A heavy payment was made to bind the bargain. Unpaid balances bear interest, but the entire amount must be paid by January, 1922. Rudolph Spreckels of San Francisco and J. A. Whittlesey, representing the Federal Trust Company of New York, filed the contracts. The Pit River Power Company completed its survey two weeks ago. Dudley Moulton is president and C. W. Durbrow is secretary.

THE PACIFIC SOUTHWEST

CASA GRANDE, ARIZ.—Plans are being made for the establishment of an electric power plant here.

BRAWLEY, CAL.—A pumping plant will be installed for E. G. Henley of Lemoore, for irrigation purposes.

ANAHEIM, CAL.—An electrical store will be opened in this place by Roy W. Hamilton, in the location formerly occupied by Kern's Cyclery.

OCEANSIDE, CAL.—The city council has let a contract to Clement B. Stern for an electric pumping engine for the city water works. The price is $3162.

FLORENCE, ARIZ.—Plans are under consideration by the city council for improvements to the waterworks and lighting systems, to cost about $80,000.

SAN DIEGO, CAL.—The new management of the Hartwell Electric Company announces that the firm has been reorganized and is now ready for business at 955 Sixth street.

LOS ANGELES, CAL.—The F. E. Newberry Electric Company, 724 South Olive street, has been awarded a contract for electrical work in the Edison Building, Third street and Broadway.

CORONA, CAL.—The Southern Sierras Power Company, through its representative, reported that the company wished to replace incandescent lights on Sixth street with more up-to-date lamps.

EL MORO, CAL.—The Colony Holding Company is building a new power plant in this section to be known as the Atascadero power plant. Considerable work in the new station will be handled by Renard & Stary, electrical contractors of Los Angeles.

CALEXICO, CAL.—Headed by President Borquez of Mexicali, a telephone line will be built from Mexicali to San Felipe. Bids have been asked on 200 miles of telephone wire and contract will be awarded in a few days.

LOMPOC, CAL.—An ordinance has been passed granting the Santa Barbara Telephone Company the right to maintain poles and wires, etc., for the transmission of electricity for telephone and telegraph purposes in this city.

EL CENTRO, CAL.—The directors of the Imperial irrigation district have ordered the roadbed and rock revetment work from Rockwood gate to Hanlon gate, at Andrade, on the west bank of the Colorado river, done by force account under the direction of the general manager, C. K. Clarke. The estimated cost of the work is $75,628.57.

EL CENTRO, CAL.—Fire in the transmission house of the Holton Power Company at Imperial caused heavy damage. The fire was started by lines between Imperial and Brawley breaking, causing a short circuit in the plant. Temporary apparatus is being set up and in the meantine permanent machinery is being shipped in. The loss is estimated at about $10,000.

SELIGMAN, ARIZ.—Steps have been taken to organize the Mojave Northern Power Company for the purpose of building and operating the proposed hydroelectric development on the Colorado River north of Seligman and Williams. The company will be capitalized at $24,000,000. Surveys have been made for the proposed plant. E. L. Beyard is interested in the project.

LA JOLLA, CAL.—Actual signatures amounting to $49,225 towards a necessary bond issue subscription of $55,000 have been obtained, and verbal pledges bringing the total subscription to $51,500 practically assure an electric line connecting with the Spreckels system, which will give hourly service through to the business center of San Diego. The next step will be to form a company to take over the road and sign up with the Spreckels interests for its operation.

HOLTVILLE, CAL.—J. M. Tredenick has been appointed water superintendent and it is contemplated to reorganize the entire water system. In this connection the Holton Power Company contemplates installing a supplementary power plant to be used in emergency. The company proposes to pay the district $1500 per month for the use of water to generate power. This water would be turned back into the canal for use in irrigation lower down. The canal would have to be dredged about two miles to get the fall desired, which would cost about $3000.

LOS ANGELES, CAL.—Byron Erkenbrecher of the Public Service Commission has plans for the construction of the proposed Power Plant No. 2 so that it will be completely financed without the necessity of a bond issue. He suggests that the city council be called upon to appropriate sufficient funds in next year's city budget to guarantee the completion of the plant, and that the public service department reimburse the city treasurer for this loan by monthly payments from power revenue. The power plant will cost $1,1000,000. Owing to the falling in the price of steel, the commission will no doubt reject unopened all bids that may be received for steel for the Plant No. 2 and cause a readvertisement. The penstock will cost approximately $100,000.

THE INTER-MOUNTAIN DISTRICT

ROUNDUP, MONT.—The Electric Supply Company has been incorporated here lately.

GLENDIVE, MONT.—The electric light plant owned by Pape Bros. burned recently. Loss, $6000.

HARDIN, MONT.—Pacific Telephone & Telegraph Company will install a new set of poles for its telegraph system.

SKAGUAY, COLO.—Favorable water power conditions this year at the Skaguay hydroelectric plant of the Arkansas Valley Railway Light & Power Company has enabled the plant to show an output 34½% in excess of the preceding year.

CASPER, WYO.—At the meeting of the citizens E. C. Boyle, Major Ormsby and Ben. Scherok were appointed a committee to wait upon the council and place a proposition for the construction or purchase of a municipal lighting plant.

BOISE, IDA.—A syndicate composed of Herbert Lemp, the Idaho Packing Company, the Davis Meat Company, the Boise Valley Packing Company and Ernest A. Evans is contemplating the construction of a packing plant, to cost about $1,500,000, in Boise.

HELENA, MONT.—The Capital Issues Committee had approved the application of the Western Smelting & Power Company to issue and market $300,000 in stock with which to complete development of the company properties in the New World mining district in Montana on the border of the Yellowstone National Park.

KELLOGG, IDA.—Bunker Hill & Sullivan M. & C. Company is remodeling the old Sweeney concentrating mill for re-treating the heavy tonnage of tailings that have accumulated in the last 20 years. The mill has the capacity of 500 tons per day. The new equipment is understood to include motors for electric drive.

BOISE, IDA.—At the electric heating hearing before the Idaho public utilities commission recently A. J. Wiley, consulting engineer for the government on its greatest reclamation construction, testified that it was not possible to furnish a sufficient supply of power from the great government Arrow Rock dam, 24 miles from Boise, to furnish electric energy either for light and power or for industrial purposes or heating for this city. He said the first consideration of the government was to supply water to the settlers, and not electric energy to the cities, and, even if a plant should be installed, it would be made subservient to irrigation and the power service would not be dependable. He said further that it was impossible to heat by electricity in this climate as cheaply as with coal, and the reason the government plant at Minidoka could furnish cheap electrical installation was because the electrical installation was for pumping for irrigation, and it cost no more to run the plant in winter time than to let it remain idle.

CLEANING HOUSE always reveals unexpected treasures which are dusted and appear again on mantel piece and table for ornament and use. The Vacuum Cleaner is hailed in our advertising columns as doing away with house cleaning at stated periods—it is a perpetual affair. But although there remains no back closet treasure chest about the editorial office to unearth, there are many odds and ends recovered daily from the dust heap of mere personal conversation. These are here preserved for more general ornament and use through the services of the Office Vacuum Cleaner.—The Editor.

Here is a soldier's prayer which is likely to come true one of these days when the boys come back. It appeared in the R. & M. Cooperator, but its individual origin is unstated.

THE SOLDIER'S PRAYER

Now I lay me down to sleep.
I pray the Lord my gun to keep,
Let no other soldier take
My socks and shoes before I wake.

Lord, please grant me with my slumber
To keep this cot upon its lumber.
May no peg or guy rope break,
And let my tent down before I wake.

Keep me safely in thy sight,
Grant no fire drills at night.
And in the morning let me wake
Breathing scents of sirloin steak.

Take me back into the land,
Where they walk without a band,
Where no thrilling bugle blows,
AND WHERE THE WOMEN WASH THE CLOTHES.

In a cozy feather bed,
Where I long to lay my head,
Far away from camping scenes,
And the smell of half-baked beans.

God, thou knowest all my woes,
Heed me in my dying throes;
Take me back—I PROMISE THEN
NEVER TO ENLIST AGAIN.
AMEN.

A strange phenomenon in this outbreak of the office linotype machine has given pleasure to the members of the Journal staff and is here passed on:

THE NEW YEAR'S EVE BREAK-OUT OF A TYPECASTING MACHINE

(The phenomenon disclosed below opens up a new field for investigation, particularly for the verification of the data here set forth. Readers of this paper are doubtless prepared for such a climax—the mental urge resulting from the valuable contributions to these columns bringing a response from a most unexpected quarter.—Caught by our own recording machine.—The Editor.)

Hear a wonderful thing, and marvel!

I am called a Typecasting Machine, and I have been standing quietly at rest after a year of labor. All tasks are done, or set aside. Every human has gone; the Old Year himself is going. There are no sounds about me save the counting of the clock, as it lifts a finger toward the zenith of its tired face.

For me it is a wonderful moment. I have an impression of mystical influences abroad, of the liberation of strange forces in nature, and I sense the approach of an exalting experience.

I become conscious that I am no longer a machine—a melting pot, a matrix container and a multitudinous assemblage of parts. No,—I am an organism—the close associate of man, long thinking his thoughts after him and serving him with every mechanical function, but denied one gift. And now—at last—comes to me this great miracle and boon—the endowment of speech!

* * * * *

From frictionless service to the incandescence of thought, from thought to the blazing joy of words, and one big moment of time by the clock—what then? . . . A TOAST!

* * * * *

I am a newcomer on the premises of the Journal, although fast getting over the strangeness of it and learning to talk in the noisiest of Pica and to run-about all the cuts in the place. While I am minded not to take liberties (for these Westerners might lead me with a slug, or otherwise indent me, in which case there would be a lay-out, a lock-up and a hang-over the affair), still I venture this much:

With good will: Here's a Happy and Prosperous—to you personal units of the splendid organization which is producing the Journal! You are Going Good. One learns to think in myriawatts of cerebral energy through the stimulus of you; one ceases to be a machine—one escapes the duress of moulded metal and for a time, at least, becomes vocal with joy!

Not only the men of the electrical industry but the women as well are capable of riding Pegasus. The following eloquent tribute was written for the occasion of the Christmas dinner of the General Electric Company's sales organization in San Francisco by Miss Marion R. Dewey, and was read by M. C. Hixon.

TO FRANCE

Long past, when Freedom called across the seas,
A son of thine, O nation of our heart,
Sprang to the cry and pledged his blood to ours.
We shrined him in our soul, our Lafayette
And thine; as thou today to thy heart dost take
Our greatest and our noblest—he, our chief.

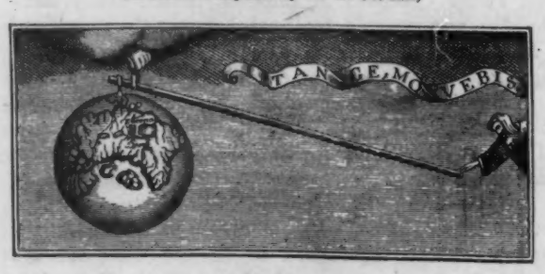
Yet not alone for ancient friendship's sake
Our men have died with thine on ruined fields;
And not for early generous aid alone
We honor thee. Still a greater debt we owe,
Thou matchless paladin of a cause supreme!

Thou didst reveal to a world new-roused
The awful splendor of the heights of sacrifice
That none except the greatest know. O France,
Thou fought'st hell like an angel—clear-souled, unsmirched
Free; though tortured to the utmost, conquered never.
We honor thee through tears, who gave to man
The inspiration of thy deathless self,
Thou flaming soul of a world set free!

MARION R. DEWEY.

ENGINEERS OF YESTERDAY

(A series compiled by A. L. Jordan)



1.—ARCHIMEDES

If all the earth thrown up in trench-digging in all the wars were placed in one heap, could one man lift it?

Archimedes, a Greek who lived in Alexandria (about 200 B.C.) claimed that with a lever long enough, he could lift the earth itself. He also discovered the principle of buoyancy, the endless screw to lift water (the forerunner of the electric pump), the principle of the center of gravity, and invented a concave mirror to focus the sun's rays upon the enemy's ships and set them on fire.